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AVIATION

The Oldest American Aeronautical Magazine

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AVIATION

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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

Lewis F. Stoll, Vice-President

Edward P. Warner, Editor
ON LEAVE OF ABSENCE

Leslie E. Neville, *Managing Editor* · S. Paul Johnston, *Associate Editor* · Daniel Sayre, *Assistant Editor* · David J. Leish, *Art Director* · Paul Wanton, *Washington*

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All planes of the country's major airlines are equipped with Western Electric Radio, which assures dependable two way voice communications between planes in flight and ground stations.

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The new—

BOEING "247-D"

a plane greater even than the "247"

BOEING

Boeing has always built tomorrow's airplanes today!

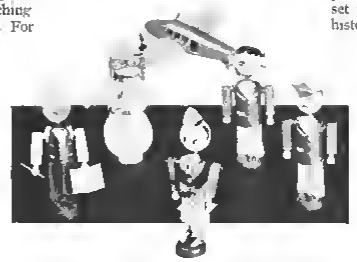
Up from Chaos

ONCE again we sit down to record air transport history. Periodically it has been our practice to devote one issue of AVIATION to review the accomplishments of American airlines, to present to the reader an up-to-date picture of their attainments. Heretofore the record has been one of continuous progress. All statistical indices have shot upward at spectacular rates. The past year, however, has witnessed a series of events that were as fantastic as they were unpredictable. We have had to make drastic revision in many of our older concepts, and must reconstruct many of our ideas as to the future.

Seldom are turning points in history as clearly defined as was that marked by the cancellation of the air mail contracts in February last. An entire industry in rapidly accelerating motion collided with an immovable object. Everything came to a full stop. The crash left those who had spent years building up a complicated and expensive machine sitting in the midst of a tangled heap of wreckage, their hands still clutching bits of control wheels and levers. For better or for worse, they had to haul themselves painfully out of the ruins and begin bit by bit the slow work of salvage and reconstruction.

To have attempted to present any picture of American Air Transport at any earlier period of this year would have been a bootless task. Now that the dust has begun to settle, however, the outlines are becoming a little clearer, the new pattern is beginning to emerge. The airways map (page 346) has taken what appears to be a permanent set, and, although shifts in ownership and control of certain lines may be expected in the near future, the general operating picture has attained some degree of stability. Most of the old lines, in renovated and purified forms, have resumed business on their old stands, and the newcomers have gotten through the critical post natal days, and are beginning to formulate ambitious plans for the future. Elsewhere in this issue will be found a tabulated résumé of who's who on the lines, a listing of the equipment in current use, and data on the mileage flown and territory covered. To lend a degree of perspective to our studies, a group of visitors from overseas have given us their impressions of air transport in America.

Although individuals have suffered heavily by the set-backs of 1934, and many an airline, new and old, is struggling along in the red under the double burden of irrational income schedules and heavy development expense, we cannot help but feel that the future may be faced with some confidence. If the events of the past year had no other result but the focusing of public and governmental attention on a long range planning program for the air transport industry, looking toward a broad policy of coordination with other elements in the nation's transportation scheme, it would have been well worth the cost. The industry is rising from the ashes of the spring of 1934 and stands poised for take-off on a flight that will set new records in the transportation history of the world.



As a background for the statistical presentation of pages 345-347, we present herewith (in three parts) a less formal picture of the current American air transport scene. First, a group of statements by certain of the operators; second, some praise, and some criticism by a number of distinguished visitors from overseas who have recently seen our air transport system in operation, and finally, the latest version of the airways map.

American Airlines

AMERICAN AIRLINES, operating subsidiary of Aviation Corporation, was organized on May 12, 1934, to carry U S air mail, passengers and express

It obtained contracts for eight air mail routes, all of which had been operated entirely or in part by its predecessor company, American Airways. At the time of organization, the new company negotiated with American Airways for the leasing of whatever physical property was necessary for efficient operation of the new contracts, including airports, intermediate fields, planes, engines, radio equipment and repair and overhaul bases

The operating inventory was purchased outright and American Airlines agreed to take over all commitments for new equipment and whatever personnel was necessary for operation of the eight routes

At the present time, American Airlines is bringing to rapid conclusion a complete re-equipment program which, at a cost of approximately $2,500,000 will result in the early replacement of virtually all planes and engines now owned by the predecessor company, with new high-speed planes of the latest and most advanced types. Included are Curtiss Wright Condor sleeper planes and day coaches, 1935 improved Douglas transports and 8-passenger Vultee passenger, mail and express planes

Under the contracts it now operates American Airlines provides direct service to 58 cities in the United States with a Metropolitan population of more than 30,000,000 people. Passenger service is provided on all routes with the exception of that portion of AM 23 between Washington and Nashville. This constitutes an entirely new airway and only mail and express is carried pending development of airport and lighting facilities along the route at which time passenger service will be started

Through the introduction of complete sleeper plane service between Dallas and Los Angeles, and between Chicago and Newark, American Airlines became the first air transport company in the world to offer these accommodations. Popularity of the sleeper planes is attested in the fact that load factors on these routes have shown a steady upward trend since the service was launched, early last summer

★

Central Airlines

WHEN the Post Office called for new bids on a number of air mail routes, Central Airlines was successful in obtaining the contract from Washington to Detroit via Pittsburgh, Akron and Cleveland. A portion of this line is over the mountains of Pennsylvania and Maryland

To operate three daily round trips over this route two types of equipment were originally used, tri-motored Stinsons and Lockheed Vegas. A number of passengers liked the single engined ships on account of their high speed but the fall weather with its fog conditions in the mountains, made it necessary to discontinue their use. The demand for increased speed today has made it necessary to consider some of the new type transport planes now in use on most of the larger lines. Within a very short time we hope to announce a still newer type ship, capable of carrying heavier loads with greater speed and efficiency.

Our maintenance base is located at the Detroit City Airport and all major service and overhaul work is done there. Other maintenance men are located along the line to handle the usual trip inspections and servicing.

Since our operation was started, we have had a steady increase in poundage of air mail carried. Our express has increased by leaps and bounds, both in the number of shipments and in the poundage hauled over the line.

Along with the growth in air mail poundage and in air express shipments Central Airlines has experienced a steady increase in passenger business, which seems to be of a sound and healthy nature

★

Eastern Air Lines

AT AN EXPENDITURE of $740,000, Eastern Air Lines is now putting into effect its most ambitious program since beginning its operations in 1927: inauguration of passenger service on all routes with two daily schedules between termini, purchase of eight Douglas Transports at a cost of $680,000; and speeding up of present Curtiss-Wright Condor equipment.

The 14-passenger Douglas liners will be put into service sometime in November between New York City and Miami, New York and New Orleans and Chicago to Jacksonville. A fast, limited service will be operated with few stops.

Our engineers expect to obtain a cruising speed of approximately 150 miles an hour from the Condors when the biplanes are fully streamlined and structural changes are made to increase useful load capacity to 6,256 lb. These ships will be used on the day round-trip schedules which will make stops for air mail passengers and express at all of the 32 cities in the 15 states on the Eastern Air Lines system.

Surveys have been completed throughout the south and along the seaboard by the mail and passenger traffic departments to launch a concerted drive for business coincidental to the opening of faster and more frequent service.

At the completion of the three point program Eastern Air Lines will increase miles flown daily from 10,448 to 15,568 over the 3,120 route-miles. Daily seat-miles over the system will jump from 166,720 to 270,960.

★

Inter-Island Airways

INTER-ISLAND AIRWAYS, Ltd., has flown 1,250,000 miles and has carried 47,000 passengers without a single casualty. This record is a tribute to the ceaseless efforts of the operating and maintenance personnel. It has gained the confidence of the public. It has borne out the wisdom of the management's insistence at every turn that the first consideration is, and must be, the safety of the passenger.

Actual operation became effective on Oct. 6, 1929, when the first unit—a Bellanca monoplane powered with a Wright J-6-300 hp. engine—carried passengers over the city of Honolulu on ten minute flights. On the first day 86 passengers made the trip—in many cases their first. Orders for other equipment suitable to inter-island service had already been placed, and by the middle of October delivery was taken of two Sikorsky S-38 Amphibions. This equipment was ready for flying by Oct. 26 and two weeks were spent on the routes to acquaint the personnel with the landing fields and the conditions of operation. Actual scheduled service between Honolulu and the outside islands commenced Nov. 11, 1929.

Service commenced with schedules providing three trips per week to Hilo and return, calling at Molokai, Lanai and Maui when requested, and two trips weekly to the island of Kauai. It was soon apparent that this service would have to be augmented and in January, 1930 another Sikorsky unit was added to the fleet. A year later a fourth was purchased. The present schedule provides daily service to all outside islands. U S mail is carried daily between the four principal islands of the group on a contract awarded on Oct. 8, 1934.

The service has become increasingly popular. The routes offer scenic beauty which is unsurpassed in any part of the world. Sightseers have been encouraged to use the planes in combination with automobile trips arranged for them on the various islands of the group. New equipment with greater passenger capacity has been ordered this year to meet the demands of business and tourist travel.

Pacific Seaboard Air Lines

PACIFIC SEABOARD AIR LINES, Inc. was incorporated under the laws of California in June, 1933, for the purpose of operating a passenger and express service between San Francisco and Los Angeles. Operations over this route were started on June 25, 1933. In addition, the company operated a service from Oct. 12, 1933, to Feb. 14, 1934, between San Francisco and Sacramento. On May 4, 1934, operations over these routes were discontinued, the company having been awarded Air Mail Route No. 8, covering the territory between Chicago and New Orleans. On June 3, 1934, mail service was opened under this contract in the Mississippi Valley General offices and main repair shops are at Memphis, Tenn., and additional divisional offices have been established at Chicago, Springfield, St. Louis, and New Orleans.

Passenger service was inaugurated on the route on July 13, 1934. This route of 903 miles is the only line connecting the largest port on the Great Lakes, with the largest port on the Gulf. The route is almost at water level from end to end. Although there are no problems of lifting loads over mountain ranges, the fog and winter icing conditions around the Great Lakes and the fog and hurricane conditions in the Louisiana territory are matters which create difficult operation problems. With the completion of the lighting of the entire route, which is now being carried on by the Department of Commerce, the company will inaugurate night service.

The company at present has plans for the installation of new multi-motored equipment of a type and design that it feels most fitted for the operation of its route. With the placing of this equipment in service it anticipates a very large increase in its passenger and express business.

★

Pan American Airways

DURING the current year when technical activities of the Pan American Airways System so materially advanced toward the establishment of trans-ocean aerial trade routes, traffic developments on its great Latin American network fairly represented, for the first time, the complete operations over the air routes following a long period of pioneering.

During the nine months of this year all departments of traffic exceeded the totals for the entire year of 1933. Mail volume on the main trunk lines steadily increased; passenger gains were general throughout the entire system; particularly on the long-distance-through route to Brazil and Argentina; and express volume showed the greatest percentage gain of all departments of traffic. Making effective the express service upon which Pan American, for the past three years has concentrated and arranged by covenants with 30 governments, a significant contract was executed through which the express shipping facilities of the American trunk line railroads were coordinated with the international air transport system. This provides, through 23,000 offices maintained by the railroads, a fast shipping service direct from the principal cities throughout the entire United States to the 147 trade centers served on the Pan American Airways System.

During August, Pan American took delivery on the first of the Sikorsky type of their trans ocean "Clipper Ships" which was flown to Rio de Janeiro and christened the "Brazilian Clipper" preliminary to being placed into regular service on the eastern run to Brazil and Argentina. During the acceptance tests of this revolutionary transport craft, the "Brazilian Clipper" regained for the United States all of the ten world records for seaplane transport efficiency, for altitude and speed with load over varying distances up to 1,250 miles non-stop. Two additional S-42's are shortly to follow the "Brazilian Clipper" out of the Sikorsky factory at Bridgeport and the first flight tests on the Martin type of Clipper Ship are expected to be started by Dec. 1.

To equalize the fast schedules which the new Clipper Ships are to make possible on the marine routes, Pan American has recently taken delivery of six Douglas Cyclone-powered transports and six Lockheed Electra (Wasp) transports for the overload routes between California and Texas and Mexico and the western trunk airline through Central America to Panama and also the Pan American-Grace route from Cristobal to Chile and to Buenos Aires.

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Pennsylvania Airlines and Transport

THE PRESENT operations of the Pennsylvania Airlines & Transport Company on the route between Washington, D. C., and Milwaukee, Wisconsin are the results of expansion and developments which have taken place since April 1, 1927. On that date, air mail service was inaugurated on one of the first of the routes known as CAM-11, between Cleveland and Pittsburgh.

After the mail line had been in operation for about one year, passengers and express were carried. In 1929, the first scheduled passenger service over the Allegheny Mountains—between Pittsburgh and Washington was inaugurated. Operations continued on this basis until the early summer of 1931, when the mail service was extended from Pittsburgh to Washington.

With the extension of the mail route,

Stinson tri-motored airplanes replaced the single-motored ships previously used; mail, passengers, and express being carried on all of the three round trips scheduled daily. In the spring of 1933, Ford tri-motored transports replaced the Stinsons, and at the end of that year five round trips were being flown daily.

Following the cancellation of all domestic air mail contracts, operations were somewhat curtailed between February and May, 1934. During the latter month, however, passenger and express services were extended to Detroit, Mich., in order that operations might conform to the route advertised by the Post Office department between Detroit and Washington, via Pittsburgh, Akron, and Cleveland.

Although the Pennsylvania Airlines and Transport Company did not receive the award of the contract for temporary air mail service on the route which its predecessor companies had developed for more than seven years, services were increased to four round trips daily, with passengers and express. The company, however, was awarded an air mail contract on AM32, between Detroit and Milwaukee.

One of the features of the operation is that between Cleveland and Detroit a course is flown over Lake Erie with land planes. This policy was adopted only after careful tests with maximum loads which showed that a high altitude could be indefinitely maintained in event of failure of one engine, and that land could be reached from any point on the course in event of failure of two engines.

After several months of this type of operations it was decided to replace the Loening Amphibions being used between Detroit and Milwaukee (including a 90-mile flight over Lake Michigan) with Ford tri-motors. These planes are now being equipped with flotation gear as an added safety factor, and will be put in service on Nov. 1.

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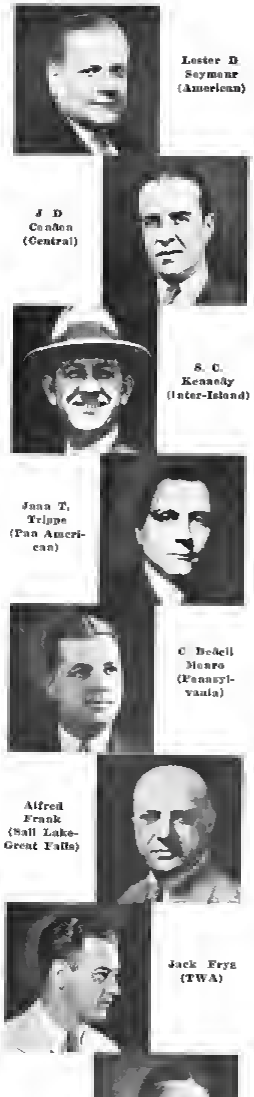
Salt Lake-Great Falls Airline

OPERATIONS of the Salt Lake City-Great Falls airline were originally commenced Aug. 1, 1928, by National Parks Airways, Inc., and conducted continuously until the cancellation of the air mail contracts in February of this year. An effort to continue the operation of the route on a reduced schedule as a passenger and express service only was made for a short period thereafter, but it proved to be a losing venture, and operations were suspended on March 10 of this year.

In response to a readvertisement of the route, a bid was submitted by Mr. Frank personally, and contract subsequently awarded to him, resulting in the resumption of operations on May 15. In August, the contract was extended, under which operations are being performed at this time.

The Salt Lake-Great Falls airline, by the connections at Butte, Montana and Salt Lake City with two of the chief transcontinental routes affords the principal cities of Montana, Idaho and Utah a connecting link to main cities throughout the United States. The route is entirely over mountainous terrain, ranging in elevation from 4,000 to 12,000 ft. above sea level, which requires the employment of highly skilled personnel and the use of the best obtainable equipment. Negotiations are now in process for the acquirement of multi-motored planes by the end of the year, or earlier, if possible.



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TWA, Inc.

ONE of the outstanding developments of this year has been the establishment of overnight transport schedules between the Atlantic and Pacific Coasts, made possible by the acquisition of the new TWA Douglas airliner, developed by the combined engineering resources of the TWA technical staff and the Douglas Aircraft Corporation.

This transport has surpassed all expectations both for speed and economy. Its 200 m.p.h. cruising speed at 12,000 ft. enables TWA to maintain the fastest air transport schedules in the world. The Skychief leaves New York each afternoon at 4 o'clock and arrives at Los Angeles at 7 o'clock the next morning with only three intermediate stops. Less than two weeks after this schedule was inaugurated, the demand for service became so insistent that a second schedule, the Comet, was inaugurated, leaving New York at 5:30 in the evening, and arriving at Los Angeles the next morning at 9:15. In reverse direction, the east-bound planes leave Los Angeles at 4 p.m. and 9 p.m. and make the journey to the Atlantic seaboard in sixteen hours.

Powered with two 700 hp. supercharged Wright Cyclone Engines, and fitted with controllable pitch propellers, flights are now being made at altitudes ranging between 8,000 and 14,000 ft.

The new Northrop Gamma, specially deagned mail plane, which was recently flown from Los Angeles to New York in eleven hours and 30 minutes by Jack Frye, executive vice-president of TWA, is being equipped with all the latest developments for high altitude flying and is being used at the Kansas City base as a laboratory, looking towards flights across the continent in about twelve hours, with one or two stops for fuel at altitudes ranging from 15,000 to 20,000 ft. or over. The Douglas equipment is now used on all passenger schedules over the entire system, the old Fords having been completely replaced by the new airliners early in September of this year. Separate mail and express schedules at night between New York and Kansas City are maintained with Northrop Deltas and Fleetsters.

★

United Air Lines

UNITED AIR LINES, Inc., represents a consolidation of four companies, the Boeing Air Transport, Pacific Air Transport, National Air Transport and the Varney Air Lines. It now operates in 33 cities, situated in fourteen states, and one foreign country. It is the largest operator in the United States from the point of mileage flown, having recently flown its 70th million mile, of which 30,000,000 miles were at night.

United is now flying at the rate of approximately 15,000,000 miles a year, of which 65 per cent is strictly a passenger service. Mail is carried on about 35 per cent of its daily mileage. United is affiliated with the Railway Express Agency in the movement of air express.

United is now operating without mail contracts a passenger express plane service, with multi-motored ships, between Chicago and Kansas City, Spokane, Seattle, Cleveland and Philadelphia, and all the rest of its routes it has been operating from seven to eight years, in each case having been the lowest responsible bidder on air mail contracts, when bids were originally called for, and again when bids were asked for, after the February cancellation of mail contracts.

The company is now operating Boeing 247's and Boeing 247-D's twin engine (2,550 hp. Supercharged Wasp motors) metal monoplanes on all routes. It is retiring from service and is disposing of its former fleet of tri-motored and single engined planes, except a reserve of single-engine planes, to carry mail when the weather will not permit operation of passenger planes.

United operations set-ups calls for major bases at Chicago, Cheyenne (which is the chief overhauling and repair base) and Oakland, Cal. Affiliated with the United Air Lines is the Boeing School of Aeronautics at Oakland Airport and United Air Terminal, formerly United Airport at Burbank on the city limits of Los Angeles.

★

Wyoming Air Service

WYOMING AIR SERVICE was incorporated the early part of 1930. Regular scheduled flight operations began May 16, 1931, between Casper, Wyo., and Denver, Col. One round trip was flown daily using two Lycoming Stinson Juniors. Within three months, three ships and two pilots were added and the line was extended to run north of Casper as far as Billings.

After three years of operation, the company finally received its first contract, being low bidder on AM Route 17, Cheyenne to Pueblo. To handle this contract efficiently, three new Stinson Reliants, equipped with controllable pitch propellers and special high-compression engines, were purchased. The original route from Billings to Denver, however, was still being operated without mail. When the Post Office department called for bids the second time, the Billings-Cheyenne route was included as AM Route 28. The company was low bidder. Three more new Stinson Reliants and one Stearman were added.

Multi-motored equipment is now being considered and will be placed in service on Wyoming Air Service lines when rates and other airmail issues are definitely settled.

The Aeronautical Chamber of Commerce

An account of its varied activities in the air transport field

Because the Aeronautical Chamber of Commerce is so closely allied with the business of air transport, we include herewith a statement which it has prepared covering its standing committees and their activities.

THE Aeronautical Chamber of Commerce of America, under Leighton W. Rogers, as executive vice-president, with Fowler W. Barker as manager of the operations division, now represents well over 90 per cent of the scheduled miles flown daily within the United States and in addition counts among its membership the Pan American Airways System, Pacific Alaska Airways and Inter-Island Airways of the Hawaiian Islands.

Membership includes Alfred Frank, American Air Lines, Delta Air Corporation, Eastern Air Lines, General Air Lines, National Airways, Pacific Seaboard Airlines, Pennsylvania Airlines and Transport Company, TWA, Inc. and United Air Lines.

One of the most active committees of the Chamber is that on air line maintenance of which Walter A. Hamilton, of TWA, is chairman. Other members are H. O. West of United, H. D. Ingalls of American, R. D. Sundell of Pan American, Felix Steinle of Alfred Frank, W. S. Rosenberger of Pennsylvania Airlines, C. M. Belinn of National Airways and E. G. Cross of Eastern Air Lines. This committee has instigated many improvements and developments on the part of manufacturers of equipment and materials used by the air lines. Under a new policy, at the next meeting to be held at Brownsville, Tex., in January, the committee will have a joint session with engineers from equipment manufacturers. Sterling Perry of Braniff and R. C. Stunkel of Bowen Air Lines, maintenance chiefs of air lines which are not members of the Chamber, have contributed to the work of this committee. It has been the policy of the Chamber during the past year to collaborate with the entire industry in all activities whenever possible, and to invite non-members to its meetings.

Another committee of the Chamber is that of air line operations managers, of which C. R. Smith, vice president of operations of American Air Lines, is chairman. Their last meeting, attended by 30 operations managers and their chief pilots was held in Washington in August preliminary to the conference called by the Bureau of Air Commerce on revisions to the Air Commerce Bulletin 7E on Air Line regulations.

Among members of the Chamber operations committee are C. N. Janes, of General Air Lines, D. B. Colyer, United, Jack Frye, TWA, C. W. France, of Eastern Air Lines, C. E. Woolman, of Delta Air Corporation, Paul Collins, of National Airways and R. B. Reinhart, of Pacific Seaboard. This committee holds semi-annual meetings one in October three months prior to the effective date of the new and revised regulations, and again in January or February of each year, or the early spring, to discuss matters common to operations men other than regulation. It is tentatively planned to have an operations committee meeting in Miami in January, 1935.

The traffic committee of the Chamber has held two important meetings this year. Even before the advent of the Transport Code last year this committee was active in the formulation of a code of ethics for the industry, under what was known as the "Air Traffic Conference."

The chairman of this committee for 1934 is Mr. V. E. Chenea, general traffic manager of Pan American. The agenda of the traffic meeting in Cleveland in August, attended by General Traffic Managers Brennan (TWA), Gill (Eastern), Rheinstrom (American), Kennedy (United) and Beggs (General), gives a good idea of the scope of the committee:

(a) Educational campaign for promotion of air passengers and express.

(b) Sales information for local traffic men.

(c) Report on distribution of air mail posters.

(d) Uniform listing for air line information in telephone directories.

(e) Uniform one-way, round-trip and interline ticket, with a different color for each.

(f) Traffic amendments, including free transportation, to Air Transport Code.

Paul Preston of Pacific Seaboard, Laigh Parker of Delta and J. V. Sheehan of National Airways are other members of the traffic committee.

The Transport Committee of the Chamber, with its membership of air line presidents, has had many meetings recently to coordinate opinion on the recommendations made to the Federal Aviation Commission.

Also under the operations division is a committee on airports. Chairman for 1934 is Steadham Acker of Birmingham, Ala., other members being W. S. Leaycraft, Curtiss-Wright Airports, H. R. Bazley, Allegheny County Airport, Pittsburgh, J. D. Crichton, Tacoma Field, Wash.; R. C. Farrell, Municipal Airport, Kansas City, Mo.; William Zelcer of Floyd Bennett Field, N. Y., and G. W. Orr of Roosevelt Field, N. Y.

The fuel and lubricants and aerial service committees are also in the operations division. These are chairmaned by Major E. E. Aldrin and Oliver Parks, respectively. Both have met this year on problems common to their particular fields.

The administration of the Air Transport Code is also a part of the Chamber's many activities.

TRAFFIC DISTRIBUTION AMONG AIR MAIL CONTRACTORS

	—% of U S tot lb-mi—			—% of U S tot pay—			Pay per lb-mi (mills)			Lb miles per plane-mile		
	June	July	Aug.	June	July	Aug.	June	July	Aug	June	July	Aug.
United Air Lines												
Newark-Oakland	50 86	49 13	46 05	24 86	22 56	22 58	0 7	0 65	0 62	519	584	620
Seattle-San Diego	4 29	4 58	4 51	6 62	5 96	5 27	2 3	1 8	1 5	171	214	237
S L C.-Seattle	3 72	3 53	3 64	7 33	6 59	5 84	2 9	2.6	2.0	154	149	173
Total U A L	58 87	57 24	54 18	38 81	35 11	33 69	0 9	0 8	0 8	390	443	474
American Airlines, Inc.												
Fort Worth Los Angeles	2 11	2.07	3.56	5 62	5 06	4 87	3.9	2.4	1.7	98	158	221
Newark-Chicago	0 71	1 29	1 21	4 04	3 70	3 65	8 4	4 0	3 0	46	96	104
Boston Newark	0 34	0 34	0 41	1 21	1 16	1 20	5 3	4 0	3 6	62	68	92
Boston-Cleveland	0 14	0 16	0 17	1 05	1 40	1 40	11 2	12 6	10 6	21	19	23
Cleveland Nashville	0 30	0 28	0 38	0 53	0 67	0 66	2 3	3 3	2 2	57	44	67
Newark-Fort Worth	0 58	1 62	1 87	0 65	1 70	1.69	1 6	1 4	1 1	77	87	115
Washington-Chicago	0 16	0 28	0 52	1 38	1 67	1.62	12 9	8 5	6 3	22	33	46
Chicago-Fort Worth	0 37	0 84	0 82	0 42	0 70	0.71	1 8	1 1	1 1	47	87	75
Total American Air	4 71	7 68	8 74	14 90	16 06	15 82	4 7	2.9	2 3	61	85	110
North American Aviation, Inc.:												
TWA Newark Los Angeles	16 13	15.05	17.40	13 26	11.89	11.96	1.2	1.1	0 86	195	214	279
Eastern Air Lines												
Newark New Orleans	1 62	1 67	2 25	2 56	2.20	2 39	2 3	1.9	1 3	80	98	142
Newark-Miami	5 42	4 77	4 60	7.35	6 60	6 70	2 0	1.9	1 8	143	147	159
Chicago-Jacksonville	1 08	1 19	1 14	1.80	1 69	1 70	2.6	2.0	1.8	75	93	101
Total Eastern Air	8 12	7 63	7 97	11 77	10 57	10.79	2.1	1.9	1 7	111	125	142
General Air Lines	4.44	3 77	3 01	2.00	1 80	1.81	0 67	0 67	0 75	356	355	319
Total North American	28 69	26 45	28 38	27 03	24 26	24 56	1 4	1 2	1 1	170	185	222
Hanford's Tri-State												
Chicago-Pembina	1.15	1 13	1 19	2.41	2 20	2 25	3 1	2 7	2 3	62	71	84
St. Paul Kansas City		0 51	0 38		1 45	1 54		6 6	5.1		26	37
Total Hanfords	1 15	1 44	1 57	2 41	3 65	3 77	3 1	3 5	3.0	62	54	64
Wyoming Air Service												
Cheyenne-Pueblo	0 20	0 24	0 26	1 12	1.00	0.99	8 5	6 0	4.6	40	57	73
Billings-Cheyenne	0 05	0 14	0 14	0 47	1 13	1 16	13 7	11 4	10 6	20	24	27
Total Wyoming	0.25	0 38	0 40	1 59	2.13	2.13	0 8	0 1	6 0	34	38	47
Northwest:												
Fargo-Seattle	1 12	1 29	1 25	4 46	4 12	4 15	5 9	4 5	4 1	56	74	81
Pacific Seaboard												
Chicago-New Orleans	0 42	0 34	0 48	1 52	1 50	1 50	5 4	3 9	3 9	52	44	45
Braniff Airways:												
Chicago-Dallas	2.58	2.38	2 12	2 30	2 07	2 08	1 3	1 2	1 2	168	182	183
Central Airlines												
Washington-Detroit	0.96	0 73	0 77	2 23	2.06	1 99	3.4	3 8	3.2	68	61	74
Long & Harman												
Amarillo-Brownsville	0 88	0 79	0 76	2 36	2 10	2 13	3 9	3 7	3 5	49	52	56
Alfred Frank												
S L C.-Great Falls	0 54	0 36	0 55	2 16	1 94	1 80	9.4	7 8	6.7	41	51	53
Robertson												
New Orleans-Houston		0 03	0 12		0 10	0 52		4 2	5 2		30	32
Delta Air												
Charleston Dallas		0 47	0 59		2 14	2 49		6 3	5 3		39	46
National Airways												
Boston Bangor-Burlington	0 05	0 06	0 07	0 23	1 09	1 14	12.1	26 1	21 0	24	11	14
Varney Speed												
Pueblo-El Paso		0 09	0 18		0 69	1 26		10 5	8 5		21	27
Penna Airlines												
Detroit-Milwaukee		0 05	0 06		0 98	0 97		25 0	21-2		15	18

Air Mail Poundage Grows

Results of the decrease in postage rates effective June 1, 1934

POST OFFICE department statistics for three months following June 1, when air mail postage was dropped from 8 cents to 6 cents per letter, reveal a substantial gain in poundage, which has possibly not even now reached its full development. Figures for the whole airmail network include the following totals arranged in each case in the order June, July, August—Route mileage 24,419, 28,222, 28,222—Miles Flown 1,909,984, 2,276,498, 2,316,684—Pound-Miles Performed 374,590,801, 454,192,862, 511,-005,729—Amount Paid Contractors $560,417, $643 671, $639,286 The average amount paid per pound-mile has fallen steadily from 1 49 mills through 1.41 mills to 1.25 mills, as the average pound-mileage to plane-mile ratio grew from 196 through 199 to the August figure of 220. In the accompanying table is shown the distribution of the traffic among the various contractors.

Viewed from Abroad

The overseas visitor looks at air transport in America

I FIND that air navigation in America, as far as the airlines are concerned, is at least three years in advance of that of the continent of Europe. I believe that this great progress is due in large part to the fact that 48 states form a single great state, so that the progress made in aeronautics does not have to be divided by 48, but the contributions of all may be merged into one. This permits of much more rapid progress toward a single goal. In Europe, each country has its own little industry, pieced, cut, divided.

It might seem ridiculous to propose to send 14-passenger planes seven times a day from Madrid to the Gobi Desert and back again, but this is done every day in the United States, the distance between Los Angeles and New York being about the same.

In order to obtain these results night-flying has been perfected. Again necessity has created a means whereby night flight can be accomplished normally with maximum safety for passengers and minimum fatigue for the navigating personnel. Accessory equipment has been developed, automatic piloting is found on airplanes of the large transcontinental systems. No European line except the Zurich-Vienna route (less than 500 km. in length) could be compared in speed to the American lines, and it holds the speed record for transport planes in Europe, thanks to the Lockheed-Orion, American equipment.

I was struck particularly by the remarkable instrument equipment, which is incomparable, and, equally, by the advancement and standardization of airplane construction.

I have the greatest admiration for American aeronautics and for its pilots.—PRINCE BIGNSCO, *President F A I.*

IN FRANCE we have more advanced types perhaps than those of America, because we have concentrated on the lift-drag ratio of our aircraft, continuously seeking to cover great distance with little gasoline. But I believe American aeronautics is ahead in the actual construction of airplanes. The perfection of pilot's cabins, the quality of navigation instruments and the development of landing fields at short intervals on which to land in case of emergency are admirable.

America is very fortunate in comparison with Europe because it is so much larger than the European countries. Because of this, there is no question of frontiers, whereas in Europe it is necessary to land frequently at borders, a great inconvenience to European pilots.

I believe that in France we have pilots and engineers of ability equal to that of the American pilots and engineers. I even believe also that as to design conception and type, we are ahead.—LOUIS BLERIOT.

I HAVE nothing but praise for your airline organization which inspires travelers with complete confidence. Undoubtedly the most striking feature is your perfect ground system of beacons, and excellence in both size and surface of your chain of landing grounds. The foresight of your government in providing fully adequate ground facilities, which, by economic law, would have taken years to fulfill if left to natural development, has, in turn, made possible the type of machines which your airplane designers have so very ably developed. You have undoubtedly realized that airplane design and ground facilities must develop together. These facts have in my opinion enabled you to produce aircraft which at present lead the world in high-speed aircraft transportation.—(via Radio)—F. T. HEARLE, *de Havilland Aircraft Company, Stag Lane, Middlesex, England.*

THE principal feature which impressed me was the meteorological and ground organizations available on all routes. This, coupled with the highly developed aircraft navigating and flying instruments, and the undoubted skill of the airline pilots to use this apparatus, does, in fact, give the European traveler every confidence in all weather, night and day. I expected the high cruising speeds from reports but not the comfort and freedom from noise experienced on your latest transcontinental types.

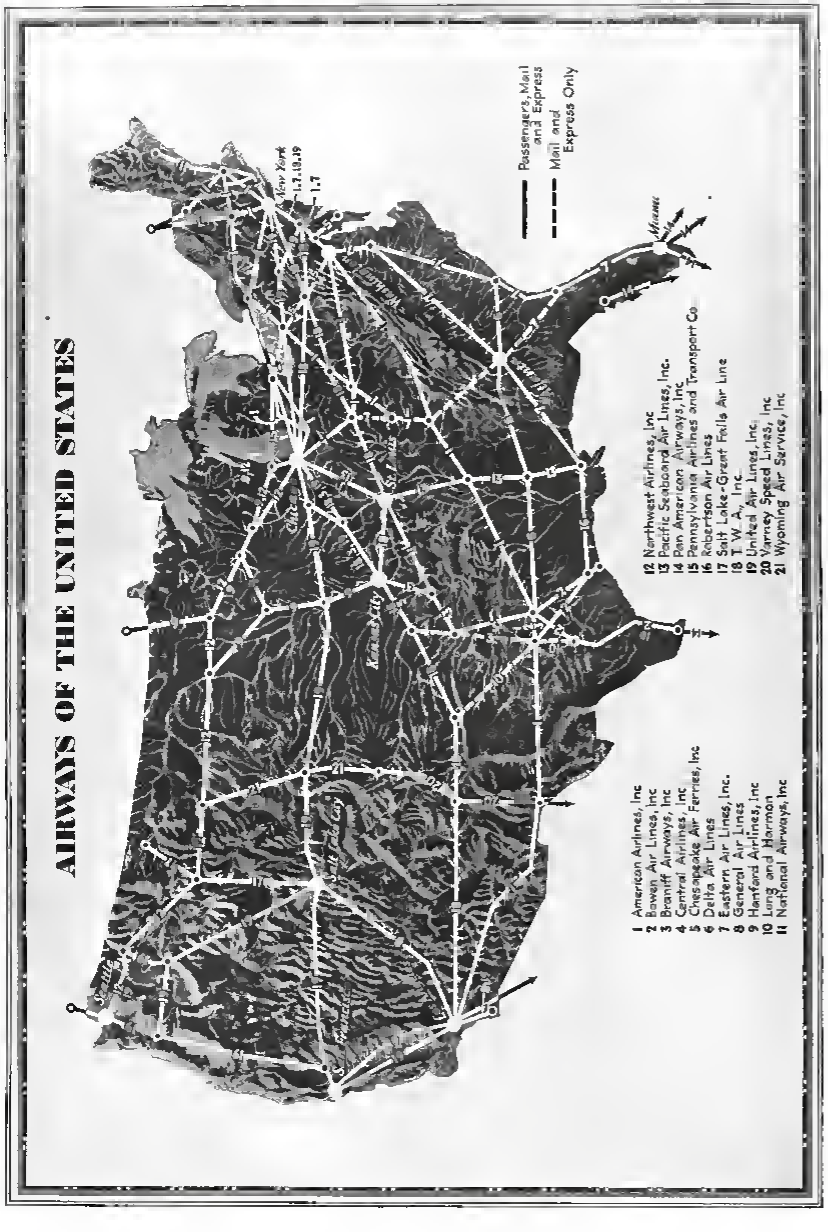
I was disappointed in several of the airports on score of position and size. This criticism applies to certain major aerodromes such as Newark. All seem to suffer from the same criticism as the majority of European airports in that the time to reach them from the business center is always an appreciable portion of the total flying time. Seeing the way New York has tackled other big reconstruction problems one hopes that the authorities will not lose sight of the opportunity at this stage to reposition and build an airport worthy of the city.

Finally a word in favor of the courtesy and help received from all pilots and ground staff, not forgetting your air hostesses.—MAJ. T. M. BARLOW, *The Fairey Aviation Company, Ltd., Hayes, Middlesex, England.*

DURING my short stay in the U.S.A. I had the pleasure of studying the organization of certain airlines in this country. I do not hesitate to say that these services leave nothing to be desired. Through the good offices of Capt. Rickenbacker the delegates to the F.A.I. Conference held in Washington availed themselves of the opportunity to visit the Newark airport where we flew over New York on board one of the TWA Douglas all-metal airliners operating in the transcontinental air service. The machine is so very well equipped that it offers the passengers the maximum requirements in safety, luxury, and comfort.

I also had the opportunity to visit Teterboro airport where I saw a number of light aeroplanes used for touring and training and I came to the conclusion that these machines represent the finest achievement ever attained in aeronautical science.—GUIRGIS AWADALLA, *Secretary of Aviation, Egypt, Delegate to the F.A.I. Conference, Washington.*

MY STAY in this country and especially my flight over several states gave me a wonderful impression of the achievements of flying in the United States. Your machines are up to date and they succeed in making amazing speeds. While in America I saw the variable pitch propellers and I was impressed with their success, particularly because there is not the slightest backlash in the mechanical system. Engines operate remarkably and without vibration. Aerodromes are organized in the best way for transport and landing passengers. On the whole I congratulate you and shall not forget the welcome all of us received in this country.—GEORGE DE RO, *Belgium President Commission on Tourisme, F.A.I.*



Name of Company[1]	American[1] Airlines Inc.	Braniff Airways, Inc	Central Airlines, Inc	Chesapeake Air Ferries Inc	Delta Air Lines
Routes Flown	New York-Montreal New York-Chicago Boston-Dallas Dallas-Los Angeles Chicago-Washington	Chicago to Dallas via Kansas City	Washington to Detroit via Pittsburgh & Cleveland	Baltimore to Cambridge Md	Dallas Tex.-Charleston S C
Personnel					
President Operations Manager Traffic Manager	C R Smith C A Rheinstrom	J E Braniff R C Schrader	J D Cowden J F Martin W G Wells	M L Hathaway M L Cleary	D Y Smith P L Higgins L C Parker
Other principal executives	Earl Ward Vice President T J Dunmore Treasurer Paul Wright Secretary	S E Perry Supt of Maintenance Paul R Braniff General Manager	J H Coulter Secy & Treas R W Coulter Vice-Pres F G Winans, Comptroller J J Wagner, Supt of Maintenance		W S Biedenharn, Vice-Pres. C E Woolman, Gen. Manager T Oliver Treas C M McHenry Secy
Total number of employees	1 129	49	67	4	43
Total number of pilots and co-pilots	136	16	9	2	7
Total maintenance personnel	359		53	1	15
Equipment					
Total number of planes	70[2]	6	8	2	19
Number of each make and model	18 C-W Condor 17 Stinson Model U 14 Ford 8 Vultee 6 Stearman 4-CM1 5 Lockheed Orion 1 Sikorsky 1 Stinson Reliant	5 Lockheed Vega (Wasp) 1 Lockheed Vega (Whirlwind)	5 Stinson (3 engines) 2 Lockheed Vega 1 Waco	2 Stinson Junior	5 Stinson (3 engines) 1 Stearman 9 Keystone (Puffers) 4 Travelair
New planes put in service { 1933 / 1934	34 28				
Number to be put into service 1935					
Number with 2-way radio	65	6[3]		None	6[3]
Location of principal maintenance bases	Chicago Ft Worth	Oklahoma City	Detroit	Easton, (Md.)	Monroe (La.) Atlanta
Number of airports of which hangars are owned or rented	14	1	1	1	3
Traffic					
Route mileage	6 720	955	464	60	1 856
Average daily scheduled mileage	24 397	3 820	2 784	300	2,112
Total miles flown { 1933 / 1934	12 302 187	1 899 852			119 890[4]
Passengers carried { 1933 / 1934	113 154	10 863			284[5]
Passenger mileage { 1933 / 1934	31 680 986	2,640 610†			85 534[5]
Average length of trip—miles	448		464		301
Average load per plane (1934) Passengers Mail poundage Express poundage	5 1 * 89 0 16 9	40% cap 105 80	3 7 158 2 25 7	300 (lb.) 1	1 4 42 1 None
Total mail poundage { 1933 / 1934	1 467 308				12 266[4]
Number of mail contracts	8		1		3
Total express poundage (1933)	274 536				None
Most traveled route	New York-Boston	Tulsa-Kansas City			Dallas-Charleston
Passengers per day	318 (1933)				
Passengers per plane	5 8 (1933)				
Date of opening of first route	May 13 1934		May 1934	Oct 1 1933	July 4 1934

[1]Statistics prior to May 13 1934 apply to predecessor company—American Airways Inc [2]Owned and leased [3]Equipped with one-way radio only [4]Period July 4—Aug 31 1934 [5]Period Aug. 5-Aug 31, 1934. *No reports available for Bowen Air Lines Long and Harmon Robertson Air Lines Varney Speed Lines. †Bureau of Air Commerce Figure.

Name of Company	Eastern Air Lines Inc	General Air Lines	Inter Island Airways, Ltd	National Airways Inc.	Northwest Airlines Inc.
Routes Flown	New York-Miami New York New Orleans Chicago-Jacksonville	Salt Lake City to San Diego via Los Angeles	Islands of the Hawaiian Group	Boston to Bangor Boston to Montreal	Chicago Twin Cities Seattle
Personnel					
President Operations Manager Traffic Manager	C W France L E Gill	R C Barrow C N James A G Beggs	S C Kennedy C I Elliott M W Mitchell	P F Collins M B Anderson J V Sheehan	F W Whitemore K R Ferguson
Other principal executives		W Doty Secretary R A Lambuth Treas.	G P Wilcox J W Waldron Vice-Pres. M F Carson Secy H S Turner Treas	Amelia Earhart S J Solomon Vice-Pres	Cecil Hunter Gen. Manager L S De Long Asst Operating Mgr E I Whyall Secy & Treas C L Stein Asst Secy & Treas
Total number of employees Total number of pilots and co pilots. Total maintenance personnel	450 68 172	59 8 20	40 8 12	40 5 15	119 25 40
Equipment					
Total number of planes	35	10	4	5	23
Number of each make and model	5 C W Condor R-30 8 C W Condor T-32 4 Stinson SM 6000 1 Stinson U 5 C-W Kingbird 12 Pitcairn Mailwing	4 Douglas DC-2 5 Fokker F 10-A 1 Stearman	4 Sikorsky Amphibion	5 Stinson Model T	3 Ford 8 Hamilton 5 Waco 3 Orion 5 Electra 2 Sikorsky 1 Stearman
New planes put in service {1933 {1934	9	2 4			3 3
Number to be put into service (1935)	10 Douglas DC7				10
Number with 2-way radio	29	9	4[8]	Experimental	10
Location of principal maintenance bases	Atlanta Newark Washington	Burbank Calif	Honolulu	Boston	St. Paul
Number of airports at which hangars are owned or rented	0	4	2	3	7
Traffic					
Route mileage Average daily scheduled mileage Total miles flown {1933 {1934	3 549 10 920 4 555 229	726 1 556 1 775 705	395 824 257 925[7]	483 1 104 321 421[9]	1 992 5 180 1 807 954
Passengers carried {1935 {1934	70,768	8,944	10 076[7]	5 471[9]	17,532
Passenger mileage {1933 {1934	10 431 860	4 465 434†	797 625[5] 1 515 510	744 574[9]	4 929 440
Average length of trip—miles	524	746	167	137 [5]	280
Average load per plane † (1934) Passengers Mail Poundage Express poundage	1 330 (lbs)[6] 142 [6] 21 [6]	4 1 140 8 24 5	6 3 24		5 0[10] 80 [10] 10 [10]
Total mail poundage {1933 {1934	793 121	308 531			231 174
Number of mail contracts	3		1	1	1
Total express poundage (1933)	96 655	35 270	37 193[7]		28 603
Most traveled route	Newark Miami	Los Angeles-Salt Lake City	Honolulu-Hilo		Chicago-Twin Cities
Passengers per day Passengers per plane	194 6	24 3 (1933) 4 1 (1933)	32[7] 6 5[7]	14 8 3 2	46(1933)
Date of opening of first route	May 1 1928	April 17 1926	November 11 1929	August 11 1933	October 1, 1926

[5]For month of September 1934 [7]Period Jan. 1-Sept 30 1934 [8]Period Jan. 1 Sept 30 1933 [9]Period Aug 11 1933-Aug. 10 1934 [10]Estimates based on loads originating at one division point only †Bureau of Air Commerce Figure.

Pacific Seaboard Air Lines Inc	Pan American Airways System	Pennsylvania Airlines & Transport Company[12]	Salt Lake-Great Falls Airlines	TWA Inc	United Air Lines Inc	Wyoming Air Service Inc.
Chicago to New Orleans	Miami Havana-Jamaica-Barranquilla-Trinidad Buenos Aires Brownsville-Cristobal Lima-Santiago-Buenos Aires Territory of Alaska China-Fegping Canton Nanking-Changtu	Washington-Detroit Detroit-Milwaukee	Salt Lake City Utah to Great Falls Montana	New York-Chicago-Kansas City-Los Angeles	New York-San Francisco Seattle-San Diego Salt Lake City-Seattle	Billings (Mont.) to Pueblo (Colo.)
Carleton Putnam R B Reinhart Paul Preston	J T Trippe A A Proctor[12] V E Chenea	C B Manes W S Rosenberger W J. Austin	Felix Stumpf F Y Wells	F E Richter Jr J W. Brennan	W A Patterson C B Colyer	R Lefeenk M W Landes G B Van Wagenen Jr
A. Culbert Asst to Pres J Slaybough Supt. of Maintenance E Murray Auditor	E E Wyman Asst. to Pres J H Johnston Comptroller J S Woodbridge Treasurer Franklin Gledhill Purchasing Agt Wm Van Dusen Public Relations	W E MacKinney Asst to Pres. J B Kohler Vice-Pres F R Crawford Secy & Treas R G Loebel Asst Secy & Treas. Comptroller	Alfred Frank Gen Manager	Jack Frye Exec Vice-Pres. F G Wilson Vice-Pres. & Treas. T P Hay Public Relations L F Arnold Asst to Exec Vice-Pres	C C Thompson Secretary C E Bank Treasurer Harold Crary Public Relations	D P B Marshall G G Brander A McLellan W B Haselmire
45 7 16	7 681	97 21 54	30 3 15	631 81 267	1,370 286 248	30 6 16
7	102	9	6	57	110	11
5 Bellanca Pacemaker 1 Bellanca Skyrocket 1 Pitcairn	14 Cons. Commodore 21 Sikorsky S-36-41 3 Sikorsky S-40 1 Sikorsky S 42 6 Douglas DC-2 2 Douglas Dolphin 1 Lockheed Electra 3 Lockheed Orion 20 Ford—3 engines 4 Ford Freighter 16 Fairchild 2 Fokker F 10 12 Miscellaneous	5 Ford 3 Keystone Loening 1 Pitcairn	4 Fokker Super-Uni 2 Boeing 40-B-4	21 Douglas 15 Ford 6 Northrop Alpha 3 Northrop Gamma 7 Fleetster 2 Fokker F-10 1 Stearman 2 Lockheed Orion	2 Boeing 247-D 35 " 247 8 " 80-A 7 " 60 13 " 40-B 15 " 40-B-4 10 " 95 2 " Monomail 5 Ford	6 Stinson Sr S-A 4 Stinson Jr 1 Stearman
	11	None	None[14]	24	59 2 10[20]	7
	95	5	6	All	110	
Memphis Chicago New Orleans	Miami Brownsville Cristobal Lima Parra Buenos Aires Fairbanks Shanghai	Cleveland	Butte (Mont.)	Kansas City Columbus Los Angeles	Cheyenne Chicago Oakland	Casper (Wyo.)
5	51	6	4	10	22	5
690 1 780 166 062[13]	31 533	686 2 746 895 450 170 638[15]	512 1 034 145 420[16]	2 609 21 042 7 036 886 5 574 475[17]	5 624 41 228 14 714 415	619 1 626 270 600
173	75 455	12 595 5 039[18]	673[16]	41 736	122 693	1 758
65 180[11]	27 511 060	2 870 502 635 263[15]	100 157[16]	19 212 454 77 267 050[17]		386 580
		269[14]	267 7	567	580	219 9
1 3[11] 105[11] 16[11]		4 5(1933) 73 0 (1935) 9 8 (1933)	2 4[11] 79 9[11] 18 5[11]	647[11]		1 6
18 346[11] 1		193 149 1	22 210[11] 1	1 113 401	3 182 163 3	
1,835[1]	716 796	26 307	2 951[10]	254 750	479 512	267
	Miami-Havana	Washington-Pittsburgh	Salt Lake City Butte	New York-Los Angeles	New York-Chicago	Denver-Casper
3 1 5		16 3[11] 6 0[11]	4 0 2 4	45%[19]	330 (1933) 35%	5 7 (1933) 2 3 (1933)
June 5 1934	Oct 27 1927	July 1 1934	May 15 1934		April 6 1926	March 16 1931

[11]Period June 3-Aug 31 1934 [12]Also Chief Engineer. [13]Statistics for 1933 from predecessor company—Pennsylvania Airlines, Inc. [14]Period July-August 1934 only [15]New multi engined equipment to be installed by end of 1934 [16]Period May 15-Sept. 30 1934 [17]To Oct 1 1934. [18]Total average load (lbs.) on each revenue mile flown [19]Ratio seat miles occupied to seat miles scheduled [20]By end of 1934

Work now under way by the Bureau of Air Commerce to improve and to extend radio aids to air navigation is discussed

By Rex Martin

Assistant Director of Air Commerce in charge of Air Navigation

AN OCEAN LINER maintains contact with the shore and other ships through its radio operators; it may carry as many as three. On an air liner, the duties of "Sparks" usually are performed by the skipper and his mate, that is to say, by the pilot and co-pilot.

Thus, in developing aeronautic radio facilities for the Federal Airways System, the Bureau of Air Commerce has kept constantly in mind that these facilities are to be used by pilots, who have a multitude of other duties to perform. Nor are they intended solely for the use of the highly trained airmen who fly with passengers and mail. Many private flyers are now equipping their airplanes with radio so that they too can follow the courses marked by the radio range beacons, listen to the broadcasts of weather information, and communicate, if necessary, with ground personnel of the Air Commerce Bureau's Air Navigation division. In each instance, we have to remember that: (1) we must make the operation of radio aids as simple as possible from the standpoint of reception in the cockpit of an airplane, and (2) improvements must grow naturally out of present procedure and practice, since sudden, radical changes would confuse the users of aeronautical radio.

Sometimes an improvement in the department's radio system is apparent to the pilot only as an increase in efficiency and dependability of a service with which he is entirely familiar. For example, radio range beacon courses used to fluctuate at night. Natural conditions affecting transmission of radio signals caused the courses to swing away from the routes over which they were intended to lie. This was solved by providing the stations with T-L, or modified Adcock type antennas which consist of four skeleton steel towers, each connected with the transmitter by an underground cable.

High towers have no place on the edge of an airport. This was an objection to the old loop antennas, and is even more marked with the new type. Accordingly the bureau has adopted the practice of establishing radio stations 2, 3 or 4 miles away from airports, where there can be no question of obstructing aircraft while landing and taking off. Such an arrangement, however, made it difficult to coordinate the work of operations officers, pilots and bureau personnel. There was a constant passing of messages between airport and radio station. In emergencies, delays of even a minute or two may be serious. Also, more operators were required, for in most cases there would have to be an office at the airport, and operating personnel stationed there and also at the actual radio station.

The Air Navigation Division's radio engineers therefore suggested remote control.

"We can't put the broadcasting station and the radio range beacon on the airport," they said, "but we can put the personnel there and let them use telephone circuits to operate the transmitters."

Remote control equipment for this particular purpose was designed, built and tested. It was entirely satisfactory. Now, at most airports the communications office of the Air Navigation division houses the radio personnel, the teletypewriter equipment, instruments for making weather observations, and remote control apparatus for the radio communication station. When it is time for a broadcast, the operator dials a number which starts the transmitter several miles away, picks up a microphone and reads the weather reports, dials another number and the transmitter goes off the air. Similarly, he controls the operation of the radio range beacon.

The split course problem

A difficulty which has not yielded so readily to our studies is that of multiple or split courses transmitted by radio range beacons in mountainous regions. The mountains, in some cases, act upon the transmitted signals to make them appear as "on course" indications at points where pilots should hear "off course."

The regular radio range beacon has a range of about 100 miles. The pilot picks up a course, follows it 100 miles, passes over the station, and then follows the opposite course to a point about 100 miles beyond the station. If these courses pass over or between mountain ranges they are subject to the multiple course complication, which may easily cause serious trouble.

A radio engineer and pilot assigned by the air navigation division to investigate this phenomenon recently finished an extensive survey which resulted in the recording of complete data on multiple courses, data which are now being coordinated and studied so that we will have a sound basis for our research. Several schools of engineering have already been invited to assign to graduate students research projects which will clarify the theory and principles involved.

In the meantime the bureau is introducing a new type of airway installation which will minimize this difficulty on new airways. This takes the form of an intermediate landing field with beacon and boundary lights, two-way radio

communication facilities, and a directive radio marker beacon at relatively short intervals along the airways. Courses transmitted by the markers are similar to those of the more powerful radio range beacons, but can be received only for a distance of 25 to 50 miles from the station. Thus, with the directional stations at close intervals, the radio courses can follow more accurately any directional variations in the airway route. Also, difficulties from multiple or split courses tend to disappear. False courses rarely cause trouble within 30 or 40 miles of the transmitter, and if any multiple courses are set up by the new marker beacons, they are so close to the true course that the pilot is not led far from the airway.

This type of installation is being made on the Northern Transcontinental Airway, from Seattle to St Paul-Minneapolis, now being constructed by the Bureau of Air Commerce under a Public Works Administration allotment.

Silence visualized

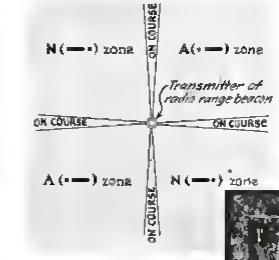
An important feature of radio range beacon directional guidance is the cone of silence directly over each transmitter. Passing through the cone of silence, when he cannot see the ground, the pilot knows that he is directly over the radio beacon station, and, since one of the four courses lies over the airport he can follow it to the landing area. But the cone of silence is comparatively small. An airplane flying at 120 m p h, at 1,000 ft altitude, passes through it in four seconds. At higher altitudes it is wider—four seconds for each 1,000 ft. Also, the momentary stoppage of the signals is a purely negative indication which may easily be overlooked by the pilot, busy with controls and instruments.

To provide a positive indication of the cone of silence, the bureau engineers have devised a marker beacon installation which emits a signal that causes a red light on the instrument board to flash showing the pilot that he is over the radio beacon transmitter.

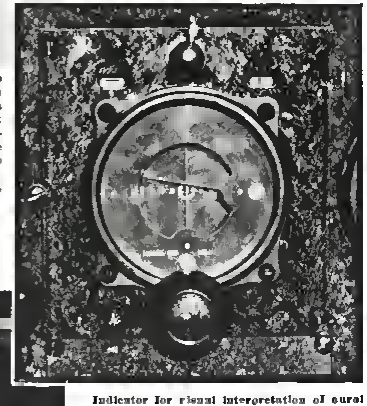
To take all of the radio directional indications out of the pilot's headphones, and put them onto the instrument board, would be advantageous, in that the pilot's ears would be available at all times to receive communications. The bureau has conducted experiments which indicate that dot dash signals similar to those now received audibly by the pilot can be used to actuate a needle on the instrument board.

Instead of sending A (. —) and N (—) for the directive signals, the radio beacon transmitter is so equipped that it will send a dot in lieu of the A, and a dash in lieu of the N whenever the aural signals are to be converted into visual indications. In either case, the signals merge into a monotone to indicate on-course. A converter in the airplane actuates a needle in a meter on the instrument panel, causing it to move to one side in response to a dot, to the other in response to a dash. When both signals are equal in strength, the needle points vertically to show on-course.

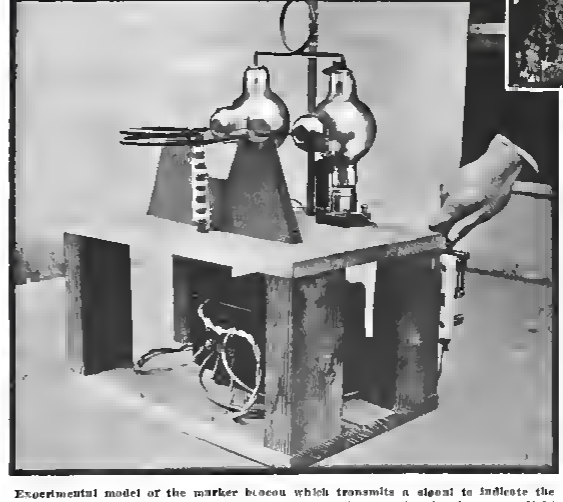
Two very attractive features of this development are (1) the pilot who does not have equipment to convert the aural radio beacon signals into visual indications can listen with headphones, following the course in the manner that is now customary, and (2) the radio range beacons on the Federal Airways System could be equipped to send the dot and dash instead of A and N by a simple



Courses marked by a radio range beacon. Flying on course, the pilot hears a steady hum broken off at intervals for a signal identifying the station. If he strays to one side of the course, he hears the letter A on the other the letter N.



Indicator for visual interpretation of aural radio range beacon signals. On course or off course is indicated by the vertical pointer—the horizontal pointer indicates volume of signals (Weston).



Experimental model of the marker beacon which transmits a signal to indicate the location of a radio range station. Received in the airplane, the signal causes a light to flash on the instrument panel.

change of cams at each station, with little expense.

Frequency selection

From visual interpretation of aural radio range beacon signals, the logical step is simultaneous transmission of radio range beacon signals and voice communications from one station on the same frequency.

Already communications and radio range beacon stations have been combined, in some instances, so that both are housed in one building and utilize the same antenna system, and the bureau now is engaged in experiments with the objective of simultaneous transmission on a single frequency.

At present, the radio beacon signals are on the air continuously until time for a weather broadcast. Stopping them while the weather reports are read, although it requires less than three minutes, may mean that they go off the air just at the time when an aircraft most urgently needs them. With simultaneous transmission, voice could go on the air at any time, and the radio beacon signals never be silenced.

This will require an extra antenna at the radio station, in the form of a fifth tower. As related heretofore, radio range beacon signals now are broadcast from the four steel towers of the T L antenna. To broadcast voice at the same time, on the same frequency, an additional tower, located in the center of the square, will be required.

Radio stations throughout the Federal Airways System now are being provided with fifth towers, but for a different purpose. At the present time, the fifth tower is used for voice transmission on an alternate frequency, when it is necessary to keep the radio beacon signals on the air continuously on the regular frequency. For example, one aircraft may want the radio beacon signals to lead it to the airport at a time when a weather broadcast is scheduled. In this case, an announcement is made on the station's regular frequency that the weather broadcast will be given on 236 kilocycles, the radio beacon signals then are resumed immediately, and the voice broadcast goes on the air from the fifth antenna tower.

Radio teletype

I have already said that the bureau, in improving efficiency and utility of radio aids, seeks at the same time to attain simplicity. Another research project now going on will have its effects entirely behind the scenes, its objective being a reduction in expense of operation. That project is the ultimate substitution of radio for the present leased teletypewriter circuits.

Teletypewriter circuits are now used for transmission of weather reports, forecasts and maps, and reports on the progress of aircraft flying along the airways. The leased wire circuits provide channels for passing this information along to airports and to the radio broadcasting stations. On a few airways, point-to-point radio is used for collecting the weather reports from the various observation stations.

But point-to-point radio, as now in operation, has limitations that do not exist for teletypewriter. The latter, even when left unattended, tirelessly pounds out a record of all messages passing along the airway. If the automatic typewriter could be harnessed to the radio waves, we should have the advantages of both. The bureau is now investigating various methods of transmitting by radio with automatic reproduction of the message as received, and if one of the systems is found practicable for the Federal Airways System, it doubtless will be adopted as a substitute for the present leased wire circuits.

Landing blind

Of all prospective advances in aeronautic radio, the one which will demand most from the pilot in radio technique, and which, at the same time, will do most to extend the usefulness of the airplane, is blind landing.

A radio system for blind landing of aircraft which the Bureau of Air Commerce developed, and which consists of a runway localizing beacon, a landing beam, and marker beacons to indicate the approach and the edge of the landing area, has a number of very desirable features. Numerous blind landings have been made with this system at College Park, Md., Newark Airport, and Oakland Airport. (See AVIATION, July, 1933.)

The Bureau of Air Commerce has followed closely the development of a radio blind landing system by the Army Air Corps, our pilots are working with the Army to determine the application of the system to civilian and commercial requirements, and have entered upon the final phase of their work in this connection. They have already made more than 150 hooded, unassisted blind landings with the tri-motored airplane NS-1. These results have come about only through the splendid cooperation of the Army Air Corps.

An important feature of the Army Air Corps blind landing system is the use of the radio compass, in itself an excellent navigating instrument. As a homing device it enables a pilot to fly with ease and certainty to any broadcasting station that he can receive.

If the radio compass becomes a standard item of equipment for air navigation, and at the same time a prime element in a blind landing system, one problem of blind landing technique is solved automatically. Using the radio compass continuously, the pilot would become familiar with its operation, and maintain his proficiency in its use at a high level. Thus when an emergency blind landing arises, he is ready for it.

After exhaustive tests of both systems, the Department has adopted the Air Corps system as the standard for procurement and installation.

Radio approach

For airports and landing fields at which circumstances do not justify installation of a complete blind landing system, the radio approach system developed by the Bureau of Air Commerce may be used. With it, landings may be safely negotiated when ceilings are as low as 50 ft. This system can be provided at any field near a radio range beacon transmitter, and as present practice is to direct one course of a radio range beacon over the adjacent landing area, that much directional service as a landing aid already exists. To supplement the beam, the airport would have to provide two marker beacons on the approach to the airport, one of them 2 or 3 miles away, and the other near the edge of the field.

The pilot, approaching above or in the clouds on the radio range course, would get the signal of the first marker and know that he should prepare for a landing. He would begin to lose altitude, and by the time he reached the second marker, near the field, would be ready to glide on down to the runway. Tests of such a system conducted at Washington Airport, Washington, D. C., demonstrated that it is dependable for landings with ceilings as low as 50 ft. A true blind landing system, of course, is designed for landings with ceiling and visibility both zero.

The future of aeronautical radio certainly will include blind landing. The radio compass also appears to be very desirable with the beacon and compass supplementing each other. With the radio compass the pilot lost above the clouds can point the nose of his airplane directly toward any radio broadcasting station whose location he knows, and fly to it. With the radio range beacon, under some conditions, it might take a pilot a half hour to orient himself on the course and proceed toward his destination (for example, if he is lost in an "off course" area, and does not know where he is with relation to the transmitter). Also the radio compass will direct him when he is flying a course which does not follow a route of the Federal Airways System. We believe that the radio range beacon also will be needed. A craft not equipped with the expensive radio compass can receive radio range beacon signals with an ordinary receiver. With or without a radio compass, the radio-equipped airplane will use the radio range beacon, not only as an aid in flying along an airway course, but also as an aid to partially blind landings at airports and intermediate landing fields.

The trend toward "on top" flying in bad winter weather has greatly stimulated interest and progress in the campaign to develop complete protection against the hazards of ice accumulation. AVIATION presents here its latest notes on recent experiences and present practices.

THERE is rarely a simple answer to any complex technical problem. A half dozen years ago when the prevention of ice accumulation on airplanes was first being studied three different methods were proposed. Upon test they were found to vary widely in effectiveness, yet today all three find some application in the equipment being adopted by airlines. Mechanical breakage of the ice cover by a pneumatic device to permit removal by the air flow is used to clear wings and tail surfaces. Dissipation of the ice by heat is used in keeping the air speed indicator pitot tubes clear. Prevention of ice adhesion by rubber coating and oil treatment retains a place in propeller protection. There may be future shifts of functional importance. Heat, for example, may some day take over the whole show. But at present the triple combination is formidable enough to justify confidence.

The pneumatic De-Icer owes its original development impetus to Dr. William C. Geer, formerly of Cornell University and one-time vice-president of the B. F. Goodrich Rubber Company. It was to him that funds were assigned by the Guggenheim Foundation for the construction of a refrigerated wind tunnel in which to study the whole general icing problem. It was through his work that the B. F. Goodrich Rubber Company became interested in the problem, and a program of flight testing and design refinement begun which was to include TAT, TWA, United Airlines, Northwest Airlines, and the Eclipse Manufacturing Company as well.

The De-Icer was first mounted on an NAT Douglas biplane and put through tests in the early spring of 1930 by Wesley Smith and R. S. Colley, Goodrich engineer. Later the same spring an improved type was fitted to a Lockheed owned by Goodrich. The second model was the first to be automatically inflated and deflated.

In the spring of 1932 a Northrop Alpha 4-A was equipped with shoes on wings and tail surfaces and put into service on the eastern end of TWA's regular transcontinental run for four months. The two subsequent winters have seen the entire Northrop fleet of TWA, De-Icer equipped. This winter the Douglas transports are being added to the TWA protected list.

Other major airline effort has been contributed by United. After a long and active interest in the problem, it developed a De-Icer suitable for the Boeing 247 transports and tested it exhaustively through the winter of 1933-34. To its engineers must go a substantial share of the credit for the development of the multiple tube shoe, the nine port distributing valve system and other features of the most modern equipment. Last summer United placed an order for 30 sets of De-Icers to be used on Boeing transports.

TWA experiences

As an important part of its research program, TWA has required its pilots to fill out a questionnaire-report whenever de-icing equipment is used. Examining some 45 reports covering 1933 and the spring of 1934 gives one a remarkable picture of modern transport operations in bad weather. For a random sample—"Where were icing conditions encountered? Albuquerque to Zuni—General Weather conditions? Snow, freezing rain, zero conditions at surface; top of clouds at 17,000 ft.—When was de-icer turned on? At 9,000 ft. over Albuquerque—How long left on. One hour and 50 minutes—Comments—Did not affect flying qualities of ship. 120 miles flown in ice. 710 miles would have been cancelled without the equipment. Functioned satisfactorily." Many others laconically mention taking off with ceilings below 300 ft. with cloud tops at 15,000, or unknown in altitude. Rain, snow, sleet, zero conditions in mountainous country, hundreds of miles of continuous instrument flying appear throughout the reports as commonplace. Hardly any of flights covered would have seemed less than fantastic five years ago.

Taken in bulk the reports establish a number of general principles of De-Icer practice. Warned by their air temperature indicators pilots set their pneumatic shoes in motion and turn on the pitot tube heaters as soon as the plane approaches potential icing conditions; initial accumulations are apt to be hardest to get rid of. Use of the De-Icers two or three hours on end is commonplace. The inflation of the leading edge tubes slows the plane but 2 or 3 miles an hour. An inflation interval of 35 to 50 seconds seems most effective. The winter mileage saved from cancellation is very appreciable, closely approaching the total blind flying mileage. Again and again the reports end with, "Would not have been justified in undertaking the flight without De Icers even though it turned out that they were not absolutely necessary."

Of the general effectiveness of the wing and tail surface De-Icers there remains little doubt. "The ice cracked along the leading edges and sloughed off" would be a useful rubber stamp at TWA terminal offices. That there are exceptionally severe conditions under which no equipment yet devised can function indefinitely is, on the other

hand, definitely admitted, just as no one would deny that there are conditions to be encountered in thunderstorms, and surface winds and fogs that are still beyond the capabilities of present day aircraft operations. To avoid such conditions airlines use every meteorological reporting and forecasting resource available, and pilots maintain the utmost vigilance. The spectacular loss of two mail planes over Pennsylvania last December in a single storm has been accepted as a lasting and permanent lesson in the formidability of the ice hazard by the entire air transport industry.

Weight reduced

The De-Icer shoes have been constantly refined in design details. The weight of the entire equipment has been reduced to 58 lb. for the Northrop installation, 75 for the Boeing. The inflatable tubes built into the shoes are made of a specially knitted stockinette fabric, covered with a high quality wax-finish rubber. Three are used on the leading edge of each outer wing panel of the Douglas or Boeing, four on each wing section between the fuselage and engine nacelle, two on each side of the stabilizer, and two on the front of the fin. Incidentally the fin tubes are of great importance because of the marked effect ice accumulation on the fin has on the effectiveness of the rudder.

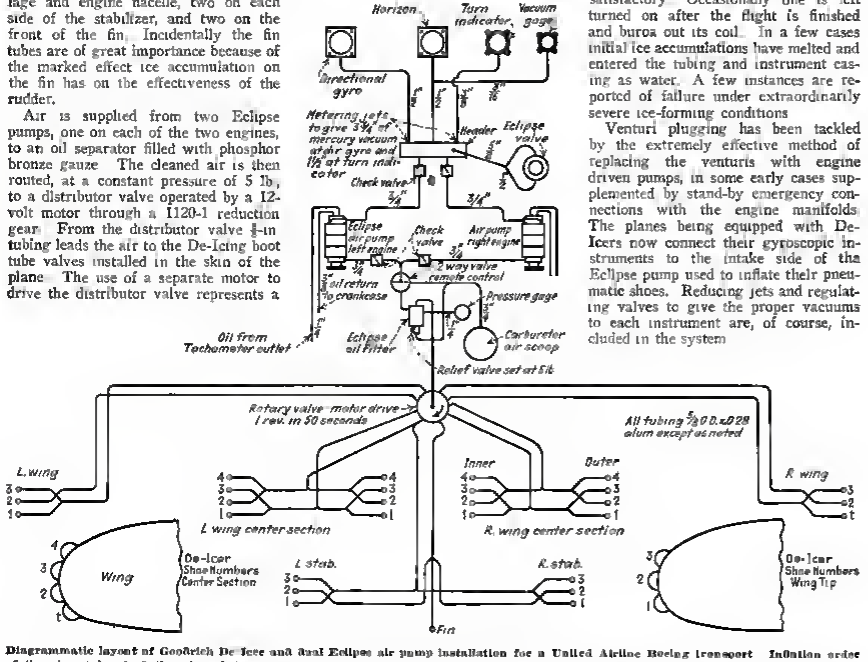
Air is supplied from two Eclipse pumps, one on each of the two engines, to an oil separator filled with phosphor bronze gauze. The cleaned air is then routed, at a constant pressure of 5 lb., to a distributor valve operated by a 12-volt motor through a 1120-1 reduction gear. From the distributor valve ¾-in. tubing leads the air to the De-Icing boot tube valves installed in the skin of the plane. The use of a separate motor to drive the distributor valve represents a distinct improvement over earlier equipment in which the distributor was connected directly to the engine pump and varied in speed with the engine revolutions. With the separate motor drive, proper inflation timing is maintained under all conditions. The load on the pumps is not great, one of the two units being sufficient to operate the entire De-Icer system. To decrease it even further, Eclipse engineers have developed an inflation order so designed that air from an inflated set of tubes is discharged into a deflated set and the pressures allowed to equalize before the second set is further inflated by the pump, thus substantially decreasing the amount of air the pump must handle. The ordinary load is so small however that United Airline experts have not deemed the device necessary for their present equipment.

Propeller guards

Once the primary problem of removing the accumulation along the leading edges of airfoil sections was solved to the extent of permitting long flights under ice-forming conditions, the effect of ice on the hub and roots of the propeller became of considerable importance. Innumerable cases of rough running were reported. Early remedies consisted simply of spreading thick tenacious oil on the affected parts at the beginning of each flight and at each landing point. Propeller hubs are now protected by large rubber covered spinners and the roots by rubber covers. Specially absorbent, the rubber is then treated with oil. The device is reported as quite effective, though the oil coating still requires frequent renewal.

By no means the least important ice hazard facing planes in bad winter weather is the plugging of orthodox pitot and venturi tubes, with a resultant failure of the air speed indicator and all gyroscopic flight instruments at a time when they are most needed. A number of airline planes have therefore been equipped throughout the last two winters with electrically heated pitot-static units consuming between 4 and 5 amp. from the plane's regular electrical system. In general the reports on hand are that the units are highly satisfactory. Occasionally one is left turned on after the flight is finished and burns out its coil. In a few cases initial ice accumulations have melted and entered the tubing and instrument casing as water. A few instances are reported of failure under extraordinarily severe ice-forming conditions.

Venturi plugging has been tackled by the extremely effective method of replacing the venturis with engine driven pumps, in some early cases supplemented by stand-by emergency connections with the engine manifolds. The planes being equipped with De-Icers now connect their gyroscopic instruments to the intake side of the Eclipse pump used to inflate their pneumatic shoes. Reducing jets and regulating valves to give the proper vacuums to each instrument are, of course, included in the system.



Diagrammatic layout of Goodrich De Icer and dual Eclipse air pump installation for a United Airline Boeing transport. Inflation order of the shoe tubes is 3 then 1 and 2 together on the outer wing panels; 2 and 4 together then 1 and 3 together on the center sections; 3 and 1 together then 2 on the stabilizers, progressive action having been found greatly superior to a simultaneous inflation of adjacent tubes. The entire installation weighs only 75 lb. and eliminates the weight and drag of three venturi systems.

Feeding air passengers, always a problem, is rapidly becoming a major consideration as competition becomes more intense. The author who has studied the matter from both the airline and the research-consumer point of view, believes that free picnic box lunches must give way to piping hot attractive meals served at the passengers' expense

By William E. Berchtold

DEEP-DISH apple pie, mountain trout broiled in butter and baked "over-size" Idaho potatoes have been credited with the power to divert passenger traffic from one railroad to another. Cuisine is an even more important consideration among trans-Atlantic steamship services, where table delicacies are rated second only to speed in determining passengers' choice of liners.

Airlines, however, have been so preoccupied with schedule changes, faster services and technical improvements that features of air catering have not thus far become primary factors in their appeal to the air traveler. But the trend is on, and airline commissary departments are certain to play an increasingly important role as competition is increased between parallel services.

As soon as the airlines became seriously interested in building up passenger business, they were faced with the problem of providing facilities for feeding passengers. Because the problem was so closely linked with the lines' ability to sell tickets, the commissary departments were first organized under the direct supervision of the traffic departments. Fares were then more than double the current rates, and it was considered good business to provide food at meal time without extra charge to the passenger. It was a selling point which the traffic solicitors cherished, because the railroads had never included such service without extra charge. The resulting service was fairly good, the cost to the operators was high, and the precedent established by providing meals without extra charge has resulted in an annual total expense to the present systems of from $150,000 to $250,000.

Western Air Express, one of the first lines in the United States to offer regular catering service in the air, carried on extensive experiments in 1928 and 1929 with a corps of fifteen uniformed stewards under the direction of Walter Davis, an experienced railroad restaurateur. Transcontinental Air Transport, whose gold plated service and lavender napkins are still remembered by veteran transcontinental air travelers, placed its staff of uniformed couriers and all arrangements for feeding passengers under the direction of Parker Sturgis, chief of transportation. Boeing Air Transport made a detailed study of foods for the formulation of an air passengers' diet under the direction of a specialist in dietetics who served as chief stewardess of the line.

High-altitude dietetics

The conclusions reached by the different services were quite uniform. Greasy, rich or fatty foods were found to contribute to air sickness, if the passenger was at all susceptible to the malady. The necessity for a balanced diet was recognized. And, it was found advisable to serve relatively light portions at frequent intervals rather than to provide heavy three-meals-a-day service.

TAT soon found that gold plates, lavender napkins, and gold plated knives, forks and other ware provide an irresistible temptation to souvenir hunting passengers. Most of the lines therefore standardized on either a high quality paper service, which is both light and sanitary, or composition plates, glasses and hotel ware which will not break or offer too much temptation to the light-fingered. Planes were equipped with from four to six thermos bottles for hot and cold liquids such as coffee, bouillon, orange and tomato juice, lemonade and water. All efforts to provide hot fish or meat entrees failed, because of the excessive weight requirements for electric stoves or hot plates and ovens. The typical meal served aloft was standardized to include a cocktail of tomato or fruit juices, hot bouillon in winter months, three kinds of sandwiches (usually chicken, cheese and ham), a fruit or vegetable salad, fruit, pie or cake, and coffee. Dinner menus varied little from those for luncheon.

When airline rates were hauled down to the level of rail-plus Pullman fares, the commissary departments were rather generally switched to the operations departments with instructions to cut expenses. This was done on many lines by eliminating couriers, stewards or hostesses and placing the task of serving meals in the tender care of co-pilots. The entrance of the co-pilot into the air catering picture soon placed food back into picnic lunch boxes, although one line dignified its service by teaching the co-pilot to spread each meal on a micarta tray for serving, which, at least, removed the picnic box from the picture. Stewards and hostesses were again coming into general favor just before the cancellation of the air mail contracts in February, but reduced air mail revenue has now eliminated stewards and hostesses from all lines except those of United Air Lines, Pan American Airways, and a few special services of American Airlines.

The whole problem of air catering is now perched on the horns of a dilemma:

If passengers are to be fed aloft, provision must soon be made for adequate kitchen facilities and an additional member of the crew to insure service comparable to that offered by first-class surface transportation media, which in turn means higher operating costs. If stops are to be made for service on the ground, valuable travel time — which is air transport's chief attribute—must be sacrificed.

The present trend is in the direction of feeding passengers on the ground where complete service in attractive surroundings can be offered. TWA's new schedules for the Sky Chief and Comet both eastbound and westbound call for meals on the transcontinental journey to be served on the ground whenever possible. Passengers check menus presented to them in the air (making a choice from three or four combinations offered for each meal) and their desires are radioed from the plane to the ground station ahead. Hot meals are ready at the airport restaurant, cutting down the time necessary for serving on the ground. Where suitable ground service is not available TWA arranges to take aboard a well-planned and satisfying meal packed in individual boxes for each passenger.

Eastern Airlines has long followed the practice of serving luncheons and dinners at stations on the ground at Richmond, Raleigh and Jacksonville, with marked improvement in the character and quality of the service within the last year. Between-meal refreshments formerly served by Eastern Air aboard its planes have been discontinued since all hostesses were removed following the air mail cancellation. United Air Lines has tempted its transcontinental travelers for several years with thick juicy steaks served at the company-owned restaurant on the Cheyenne airport, although all other meals are served aloft by uniformed stewardesses. American Airlines serves passengers on the ground whenever airport facilities are adequate and a sufficiently long stop is scheduled, although many flights still call for serving light lunches aloft. General Airlines (Western Air Express) continues to serve in the air to cut down travel time on its Los Angeles-Salt Lake route.

Pan American carries beer and wine on most of its runs. The Brazilian division includes a cocktail service. At the proper hour of course.

Right: A stewardess on a United Airliner serving a light lunch. Even the stewardess is lacking on most lines. The feeding of passengers then becomes a part of the co-pilot's regular duties.

A TWA Feed in the picnic box era. Economies forced by reduced air mail income, the burden of the "no charge for food aloft" practice, and space and weight limitations have kept most lines in this country from supplying better.

Pan American Airways serves luncheon aloft as well as refreshments during the morning and afternoon, but catering services both in the air and on shore are at the passengers' expense.

Imperial profit

Can the airlines' commissary departments be made to pay their own way? If the experiences of the railroads are any criterion, few dining car services show a profit, some break even in good years, and most of them show a loss. This is true despite the fact that passengers pay, and pay well, for the meals served aboard train. Some railroads consider it good business to set up a fund which will take care of a limited loss from dining car service so that a sufficiently attractive fare can be provided to lure passengers from competing lines (and probably from those airlines which have inadequate service), offsetting commissary department losses by increased revenues from passenger fares.

Perhaps the only airline in the world which ever showed a profit on its catering department is Imperial Airways. Its system is worth examining, because its commissary service aloft is more extensive than that of any other airline in the world and because it returned a profit to the line from 1931 through 1933. A new policy adopted during the current season calling for even more extensive dining service aloft than has been provided during the last three years has changed the catering account to a deficit item. However, the addition of an expert chef and two stewards aboard liners of the Scylla class has increased the passenger load factor sufficiently to more than balance the loss on catering.

Passengers pay for food and drinks served them aboard Imperial's planes. Dinner is five shillings, luncheon, four shillings, and the continental breakfast 1/6, rates which are higher than American lines have generally considered it possible to get even for a complete service. These meals, which include hot food as well as cold, were formerly prepared on the ground under contract with caterers at the terminals and served in the air by the lines' own stewards. Under the new policy, part of the preparations are done aloft by the flying chefs. Pantries are provided on board ships of the Heracles, Hannibal and Atalanta class and a full kitchen has been included in the newer ships of the Scylla class used on the cross channel service. Hot food which may include roast duck and apple sauce or curried beef and rice is stored in electrically heated warming ovens until served. Dinner includes hors d'oeuvres, hot soup, hot fish, hot entree, or cold buffet and salad, sweets, dessert and coffee. Luncheon includes a choice of hors d'oeuvres or soup, cold buffet or hot entree, salad, fruit and coffee. Whisky, brandy, gin, sherry, port, lager and ginger ale are also carried with an appropriate tariff for each item.

Imperial Airways liners of the Scylla class carry a chef and two stewards. Dinner costs five shillings—and is worth it.

TAT's original service included tablecloths, lavender napkins, gold plated cutlery and dishes. Souvenir collectors swiped everything but the tablecloths.

Profit on the liquors, which is large, coupled with a profit of 25 to 35 per cent on food served, has heretofore paid the salaries of two stewards carried on the bigger ships. What is more, from the standpoint of building passenger traffic, the catering service is considered second only to the speed and convenience of air travel in attracting patrons. Traffic on the most popular schedule of the day (the Silver Wing) has been built up almost wholly on the appeal (stressed in newspaper advertising) of a "five course luncheon served with your favorite wine while you fly to Paris during the noon hour." The size of these ships — 38 passengers — makes it reasonably economical to carry added weight and to sacrifice the necessary space for kitchens and serving facilities which might not be possible on 10 or 15-passenger units. But the Silver Wing at least points the way to what may be done to bolster up airing schedules which are without adequate catering service at the luncheon or dinner hour. Ludington's old noon schedules had notoriously low load factors as compared with those at other times during the day. Passenger traffic charts would show up many another schedule now being offered, which suffer from lack of attractive dining facilities on the ground or on short intercity flights, in the air.

The liquor question

One or two lines have toyed with the idea of serving liquor on board their planes as a new service to the passenger and an additional source of revenue. Pan American Airways carried beer and wine on most of its routes, and the Brazilian division even includes cocktail service at the appropriate hour. TWA is considering the possibility of serving cocktails on some schedules before landing for dinner on the ground, and its passengers may soon be able to order champagne. Apparently it is the only beverage which has been acclaimed as an aid to those who are susceptible to air sickness and at the same time promises to pay its own way, with a tariff sufficiently high to offset the weight loss required for storing it on board plane. It is not likely that beer, heavy in weight and low in profit, will make an early appearance. Officials of United Air Lines, American Airlines and General Airlines (Western Air Express) do not favor the serving of liquors aloft. The Department of Commerce has not yet lifted its old ban against carrying intoxicating liquor (or intoxicated passengers) on board transport planes, a hangover from prohibition days.

Regardless of what may be done to obtain new revenues from the sale of liquors aloft the precedent set by serving food in the air without charge to the passenger must soon be broken. It was established at a time when rates were double and triple their present level, and the reason for starting the practice has long since disappeared. The present trend toward the serving of most meals on the ground, where more elaborate menus including hot foods can be offered and the passenger has always paid for his meal, has already eliminated part of the burden. The remainder can be removed or decreased by offering service aloft far beyond that of the picnic box lunch era and *at the passengers expense*. Travelers, already accustomed to paying for what they order on surface transportation systems, will gladly pay for such improved service. The sooner the designers of transport planes make adequate provisions for the serving of hot meals aloft, the better it will be for air passenger traffic. It is an eventuality which should be recognized now so that each design will progress toward the desired goal.

As new mail schedules are added to existing operations by the Post Office Department, airline executives are faced with the complex problem of determining the real costs involved. To shed some light on this important subject, the operating costs of four modern transport airplanes have been analyzed in detail.

COSTS

By Alvin P. Adams

National Aviation Corporation

RECENT authorization of additional air mail schedules by the Post Office Department, and its announced intentions of making further additions, hold out some promise for improved earnings for various air mail operators who have been suffering losses under the present contracts. The real benefits accruing from the addition of new schedules are seldom appreciated, however, unless a thoroughgoing analysis has been made of the true costs of operation, especially of the relationship between direct flying costs and general overhead. Cases are on record where extra schedules have been dropped, or eliminated from consideration because costs as originally calculated were in excess of potential revenues. Had proper analysis been made the schedules could have been flown without real loss with the load factors actually available. Each case that comes up must be treated on its own merits, but the methods employed in the following article may be generally followed for any particular operation or any type of equipment.

Some lines given additional mail schedules have already been flying the same schedules with passengers and express only, and since the cost of handling mail is slight, practically all additional mail revenue may be credited to net income. Exceptions are where changes in schedules are required which reduce passenger revenue, or where additional stops are necessary, or when mail poundage displaces passenger loads. It is believed, however, that such instances are rare.

Even in cases where the extra schedules have not been flown prior to the authorization of the additional mail service, a favorable portion of the mail revenue will accrue to net income, for in general, the mail payment, plus the additional passenger revenue developed, will exceed the real cost of flying the extra schedule. In few instances will the revenues be sufficient to cover much, if any, of the general overhead or ground costs which normally would be allocated to the schedule, but the company's financial position will be improved by the extent of the excess of revenue over direct costs. This should be appreciable where a company already has available the equipment and line and ground crews necessary to handle the servicing and communications of the new schedule. Where additions to ground crews must be hired, however, or where a new airplane must be purchased to take care of the extra schedule, so much extra overhead might be entailed that unless the mail rate was quite favorable, and/or the passenger revenue developed was substantial, the profitableness of the additional service would be questionable.

Composition of costs

Neglecting, then, the element of management and its effect on the cost of any business, the operating costs of an airline depend on two things: (1) the equipment employed, and, (2) the number of schedules flown. The first item influences directly the flying costs per mile, for the number of engines and their horsepower have a great bearing on fuel consumption and motor overhaul costs and airplane maintenance and overhaul costs are dependent on airplane size and type of construction. The first cost of the plane affects depreciation and insurance costs, and finally, the speed of the equipment has an influence on practically all flying costs. The latter becomes of considerable importance in determining the per mile costs, since most flying costs of an airplane depend on the hours flown, and clearly, the more mileage that can be covered in an hour, the smaller the per mile costs. Inasmuch as an airline's ground expenses, or overhead, increase but slightly with increased schedules, these costs will decrease per mile almost in proportion to the increase in schedules operated. Theoretically, therefore, as schedules are increased the total operating costs per mile would be reduced until they gradually approach the flying costs of the equipment operated.

Ordinarily, the flying costs of an airplane consist of

- Pilots' pay and expenses.
- Gasoline and oil.
- Maintenance of planes and engines.
- Aircraft communication.
- Plane and engine depreciation.
- Aircraft insurance.
- Passenger supplies and expenses.

The overhead costs change little in the aggregate amount with increased schedules, and therefore (on a per mile basis) vary greatly with the mileage flown. They include

- Operations:
  - Superintendence.
  - Rents, hangars.
  - Hangar employees and line personnel.
  - Communications.
  - Other depreciation and insurance.
- Traffic and advertising.
- General and administrative.

In the past there has been a definite tendency to consider the total flying cost as the cost of the additional schedule. As a result, some lines have been hesitant to fly additional services without mail payments in spite of the fact that such schedules might easily be counted on to develop a satisfactory amount of passenger business.

This assumption would normally be justified if flying equipment was being utilized to the utmost extent, and if maintenance personnel were constantly kept busy, in which case any increase in schedules would necessitate a proportionate increase in equipment, and in ground and maintenance personnel. This has been far from the case however, for few lines are getting much better than 130-150 hours per month use out of their equipment and schedules are ordinarily so infrequent that there is usually not a sufficient amount of maintenance work to keep all maintenance personnel continuously busy. Actually, therefore, not only can the equipment itself do more work, but also the maintenance personnel. Where this is the case, the cost of flying extra schedules is substantially below actual direct flying costs as classified above.

Although conditions vary on different lines, and admittedly the cost grouping presented herein will not apply to all cases, in general, it can be said that the expense items entering into the real costs of additional schedules (where no additional equipment is necessary) are:

1. Pilots' pay expenses and compensation insurance.
2. Gasoline and oil.
3. Motor depreciation.
4. Motor overhaul.
5. Motor and plane parts.
6. Passenger liability insurance.
7. Public liability and property damage insurance.
8. Ticket sales commissions.
9. Miscellaneous.

These, then, are the real costs to be considered in calculating the returns from extra schedules.

Piloting costs

Pilots' Pay—Probably the largest single elements of operating cost are the salaries and expenses of flying personnel. At present, most of the larger lines are paying according to a rate established by the National Labor Board.

Speeds	Day Rate Per Hour	Night Rate Per Hour
Under 123 m.p.h.	$4.00	$6.00
125-139	4.20	6.30
140-154	4.40	6.60
155-174	4.60	6.90
175-199	4.80	7.20
200 and up	5.00	7.50

Bonus: under 10,000 miles of flying per month 2 cents per mile for each mile over 100 m.p.h. From 10,000 to 11,999—1½ cent per mile for each mile over 100 m.p.h. 12,000 miles and over—1 cent per mile for each mile over 100 m.p.h.

Base Rate: $1,600 per year to start with an increase of $200 a year until the maximum of $3,000 is reached.

The pilot's monthly pay check, then, is made up of the base rate, plus the appropriate hourly figure, plus the mileage bonus.

Assuming the average pilot flies 80 hours a month, the co-pilot a like number, using a rate of 8 per cent per month as average compensation insurance, and a figure of $30 per month representing away-from-base expense of the pilot and co-pilot, Table I represents the pilot costs of four modern two-engined planes.

Fuel and depreciation

Fuel Costs—Gasoline and oil constitute the second largest item of operating expense. These costs depend on (1) the price of gasoline and oil and the taxes levied thereon, (2) gasoline consumption and (3) the speed of the plane. Although prices will vary considerably, it is felt that a fair average price for the higher octane rating gasoline including state and federal taxes, would amount to 17 cents a gallon. Average price for oil would probably be 45 cents a gallon. Table II indicates a fair average fuel cost of each of the four transport airplanes.

Engine Depreciation—Another important flying cost which is incurred regardless of mileage flown, is depreciation of engines and propellers. Although there is a great variance in rates used by different lines, it is believed that 3,000 hours would probably be a fair average. Some lines are using a 2,500 hourly rate while others are as high as 3,500. Ordinarily propeller depreciation rates correspond with engine rates. These expenses will vary with engine and propeller costs, the rate used and the airplanes' speed.

Depreciation of airplane and instruments are not included here under cost of flying extra schedules, inasmuch as with the surplus equipment on hand no additional equipment is needed, and since most lines are using a yearly rate of depreciation rather than an hourly rate, no increased cost is encountered. With few lines obtaining more than 130-150 hours of flying per month per plane, and where schedules and the route will permit, it is quite feasible to reach 250 to 300 hours per month (one line actually obtained 235 hours per month on a fleet of multi-motors in the summer of 1932) it is seen that considerably increased flying can be done before plane depreciation costs will become a factor in extra schedules.

Table III shows engine and propeller depreciation costs on the four planes.

Maintenance

Maintenance, Engine Overhaul—One of the obvious maintenance costs which goes up with increased flying is for engine overhaul. Since engine overhauls are given after a certain hourly period, it is clear that the airplanes' speed will have a great bearing on the per mile cost. Other influences will be the engine design itself shop efficiency, engine parts cost, and the individual line's parts replacement schedule.

A probable average of engine over-

Table I: Piloting Expense

Plane	Speed m.p.h.	Base Rate Pilot	Co-Pilot's Salary	Pilot's Hourly Rate (50 Per Cent Night)	Pilot's Mileage Bonus	Compensation Insurance	Expenses (Average)	Total Piloting Costs (Month)	Cost Per Mile
A	140	$175	$200	$440	$64	$71	$30	$960	$0.0873
B	160	175	200	460	48	71	30	984	0.0769
C	170	175	200	460	56	79	50	1,000	0.0735
D	170	175	200	460	56	79	30	1,000	0.0755

Table II: Fuel and Oil Costs

Plane	Speed m.p.h.	Gasoline Consumption, Gal. per Hour	Oil Consumption Gal. per Hour	Gasoline Cost per Hour	Oil Cost per Hour	Total Fuel and Oil Cost per Hour	Total Fuel and Oil Cost per Mile
A	140	85	2.3	$14.45	$1.13	$15.58	$0.1113
B	160	65	2.0	11.05	0.90	11.95	0.0747
C	170	46	1.5	7.82	0.68	8.50	0.0500
D	170	83	2.3	14.45	1.13	15.58	0.0916

Table III: Engine Depreciation

Plane	Speed m.p.h.	Engine and Propeller Cost	Depreciation Rate—Hours	Cost per Hour	Cost per Mile
A	140	$15,000	3,000	$5.00	$0.0357
B	160	13,300	5,000	4.50	0.0281
C	170	10,000	3,000	5.33	0.0196
D	170	15,000	3,000	5.00	0.0294

Table IV: Engine Overhaul Costs

Plane	Speed m.p.h.	Overhaul Periods Hours	Average Cost per Engine	Average Cost 2 Engines	Cost per Hour	Cost per Mile
A	140	350	$550	$760	$2.00	$0.0143
B	160	330	325	650	1.86	0.0116
C	170	350	275	550	1.57	0.0092
D	170	350	350	700	2.00	0.0118

haul costs for four transports are given in Table IV.

Maintenance, Material Inasmuch as material for plane maintenance depends largely on the number of landings or trips made, speed is not a factor of these costs For instance, such items as brakes, tires, cables, and batteries, which constitute the bulk of these expenses, are replaced not on a basis of hours flown but on the actual condition of the part. This usually varies with the miles flown, or take offs and landings, not the speed of the plane while in the air. As regards engines, however, where such things as spark plugs, etc., are replaced on a basis of hours flown, the speed of the plane is a factor Although there is a wide variance in the figures of certain lines as regards this cost, it is believed that a fair average would be about 2½ cents per mile, for the four airplanes used as examples herein.

Maintenance, Labor The amount of maintenance required depends not only on miles flown, or on take offs and landings, but also on the hours flown, the normal basis of the regular periodic maintenance checks Naturally, maintenance features of the equipment and standards maintained by the line involved also affect this cost. The extent to which this expense is met on additional schedules, however, will vary greatly Where the frequency of service is sufficiently great so that there is a steady amount of work moving through the maintenance department, it is quite likely that labor costs will increase proportionately to the amount of increased flying This is usually not the case, however, and in this event the maintenance crew can be counted on to handle somewhat more work with little or no increase in personnel It is quite possible that on the average additional schedules can be flown for about 66 per cent of the labor maintenance cost per mile of the existing service That is to say, where labor maintenance (exclusive of overhaul) has been approximately 3 cents per mile, the additional schedule could be flown with a cost of only 2 cents per mile for this item As a matter of fact, these figures actually represent a rough average labor maintenance cost for the four transports included in this study

Maintenance, Plane Overhaul No additional cost is figured for this item as, with the new all metal transports now in use, it is felt that the ship will be depreciated before an overhaul is actually needed In this connection it is of interest to note that certain planes now retired have between 5,000 and 6,000 hours without overhaul It is hoped that new equipment will be able to exceed these figures substantially

Table V summarizes the maintenance costs incurred from flying extra schedules for the group of various transports In applying labor and material costs certain allowances have been made for size of the plane, cost of parts, etc.

Insurance

Inasmuch as the present article assumes no increase in equipment necessary to fly certain increased schedules such important insurance items as crash, fire, theft, etc, are considered as overhead A certain percentage of the fleet value of the equipment is ordinarily set up for these items and the charge made monthly, regardless of mileage flown This may be an erroneous method of charging for the insurance, since, with crash coverage particularly the crash hazard increases with more flying but until the method is changed, the charge will not apply on additional schedule costs There are two important insurance costs, however, which are met in extra flying These are (1) passenger liability, and (2) public liability and property damage The rate basis for the former is usually mills per passenger mile, and for the latter, mills per airplane-mile Although rates in both instances vary greatly, a fair average might show 3 mills per passenger-mile for passenger liability, and 2 mills per mile flown for public liability and property damage Assuming therefore, the additional schedule flown resulted in four passengers carried, the additional insurance cost would be $0 015 per mile, including public liability and property damage This assumes a uniform insurance rating for all the planes and the lines operating them

Commissions and miscellaneous

Another important item entering into the cost of flying and additional schedule is agents' ticket commissions The present agent's commission approximates 5 per cent, and although the percentage of tickets sold by agents will differ tremendously for various lines it is likely that an average might show as high as 60 per cent of an airline's sales were on commission Thus, if the extra schedule resulted in four or five additional revenue passengers, the agent would normally receive 5 per cent of 60 per cent of the total figure received at $0 060 per mile, or somewhere near $0 0080 per mile on the average

Miscellaneous costs amount roughly to $0 0075 per mile flown regardless of mileage They include such items as additional telegraph and telephone costs entailed by the extra schedule, passenger supplies and expenses, including maps, packets, meals, bus transportation losses, etc, and additional field rentals or landing fees incurred

Summary

All the cost elements for the four airplanes under consideration have been assembled in Table VI to produce the total direct flying costs

Since our estimates show that the direct flying costs for the group of transports selected may range from about $0 21 to $0 33 per mile, it is obvious that relatively light revenue loads of mail and/or passengers will make the addition of an extra schedule (under the circumstances outlined) economically justified For example, assuming ships of 12-15 passenger capacity and a load factor of only 33 per cent, the 4 or 5 passengers would yield a return of $0 24 to $0 30 per mile, or approximately enough to cover the direct flying costs Any revenue from mail then accrues directly to income Conversely, if the mail volume is sufficient to cover a substantial part of the direct costs, a very few extra passengers will more than make up the total expense

New schedules thus established may easily prove to be traffic builders By making extra services available to the public they undoubtedly attract new customers Before long, the load factors may increase sufficiently so that the one time "extras" become "regulars" and will be able to stand their proportionate share of the general overhead

Table V: Summary of Maintenance Costs

Plane	Engine Overhaul per Mile	Maintenance Material	Maintenance Labor	Total
A	$0 0143	$0 0300	$0 0250	$0 0693
B	0 0116	0 0250	0 0200	0 0566
C	0 0092	0 0200	0 0175	0 0467
D	0 0118	0 0250	0 0200	0 0568

Table VI: Total Direct Flying Costs

Plane	Speed m.p.h	Pilot Expense	Fuel & Oil Costs	Power Plant Depreciation	Total Maintenance Costs	Insurance Costs	Ticket Sales Commissions	Miscellaneous	Total Direct Flying Costs
A	140	$0 0875	$0 1113	$0 0357	$0 0693	$0 0150	$0 0080	$0 0075	$0 3343
B	180	0 0769	0 0747	0 0281	0 0566	0 0150	0 0080	0 0075	0 2668
C	170	0 0735	0 0500	0 0196	0 0467	0 0150	0 0080	0 0075	0 2203
D	170	0 0735	0 0926	0 0294	0 0568	0 0150	0 0080	0 0075	0 2818

OPERATION AT DESIRED CRUISING CONDITIONS, PART EIGHT

Climb and Descent in Cruising Control

By Edmund T. Allen and W. Bailey Oswald

THE "point-to-point" cruising speed of an airplane is only partially determined when the speed and the engine and airplane characteristics are known in level flight. Cruising charts for the level flight condition have been fully treated in preceding articles. They are essential, but not sufficient It is necessary as well, to include the effects of climbing to, and descending from the normal cruising altitude

As engine power and supercharging increase, speed range and cruising altitudes also increase Differences between speed in level flight and in climb or descent are greater, but longer time is consumed in getting up to and down from the cruising altitude It cannot be assumed, therefore, that point-to point flight at high altitudes is faster or slower than flight at the same power at low altitude Whether the time lost in climbing to, or saved in descending from a definite altitude is compensated for by the increased velocity at altitude depends primarily upon the length of the trip, the altitude of the points of take-off and landing, and the magnitude and direction of winds at altitude These factors will determine at what altitude it is most advantageous to fly The manner of climbing and gliding also will contribute toward the overall "trip" cruising speed

In short, the "trip" cruising speed is the composite result of the entire operation from the point of take-off to the point of landing, depending upon the length of trip, the winds encountered, and the airspeed during all portions of the flight.

Because engine reliability and maintenance costs depend on power output it is normally desirable that the power be kept within the specified cruising limits It is recommended for climbing, however, that the output be maintained at the maximum allowable limit rather than at any lesser value. Rapid climb makes for safety, especially at take-off, and furthermore it is advisable to reach cruising altitude as rapidly as possible so that the more favorable stabilized cruising conditions can be established as soon as possible It is generally preferable to keep r p m well up in the interest of low manifold pressure, since the probability of engine failure at constant power is greater for the lower r p m with the attendant high manifold pressures and tendency toward vibration

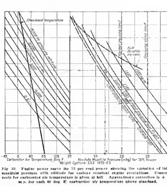


Fig 32 Engine power curve for 75 per cent power showing the variation of intake manifold pressure with altitude for various constant engine revolutions. Correction scale for carburetor air temperature is given at left Approximate correction is + 1 0" m.p. for each 40 deg F carburetor air temperature above standard.

Example for 11,000 ft. pressure altitude, 75 deg F carburetor air temperature, 1 880 r.p.m., the manifold pressure for 75 per cent power is 28 8 in hg The example is shown by the numbered points and dashed lines with arrows.

It is recommended, therefore, that in climb the engine output be kept at the cruising limit and that the propeller be set in low pitch Modification may be necessary in certain cases, but unless investigation shows that considerable gain results from operation of a different type, the low-pitch power-output-limit climb should be maintained This type of climb is especially necessary for cruising at the lower altitudes with highly supercharged engines, because of the rapid decrease in cruising velocity at the specified manifold pressure limitation Reference to the cruising curves in Fig 28 (AVIATION, October, 1934) will serve to illustrate the rapid increase in velocity below 4,000 ft. along the 30 in Hg constant manifold pressure limit as altitude is increased

Constant power curves

A convenient type of constant-power engine curve is plotted in Fig 32, from which constant power can be maintained by controlling intake manifold pressure and engine r p m An auxiliary scale is provided to facilitate making the required correction for carburetor air temperature (which assumes power inversely proportional to the square root of the absolute temperature) The use of this constant-power chart and auxili-

ary scale is similar to the use of the previous cruising charts. Several alternative types of chart for constant power can be drawn, such as shown in Fig 33, or Fig 7 (AVIATION, May, 1934) to which a carburetor air temperature correction scale would have to be added Illustrative examples are included in Figs. 32 and 33.

The constant-engine-power curve is used principally for maintaining the desired power during the flight tests on cruising climb and descent. While the cruising charts for velocity assume level flight, the chart for cruising climb assumes constant power The number of independent variables that can be explicitly handled in a chart is limited, hence the necessary (sometimes implied) condition for each type of flight (such as constant power, or level flight) makes the problem suitable for piloting control

The constant-power charts can be used in any type of flight, whether climb, level flight or glide. For example, should it be required to check the guaranteed cruising velocities at 75 per cent power at a particular density altitude, the pilot can readily obtain the necessary information by flying level at this altitude, and by adjusting the throttle according to Fig 32 or 33 to obtain the manifold pressure and r p m required for the given altitude and carburetor air temperature The actual adjustment is relatively easy as study of these figures will show Since the intake manifold pressure has a greater effect upon power than r p m, the particular power is easily attained by setting the throttle for the approximate manifold pressure, then correcting the manifold pressure slightly to adjust for the exact engine revolutions

In a test where many factors need continual adjustment such as in the constant-power climb, it is advisable to assign to one observer the task of operating the throttles for maintaining the power by use of the power curves and engine instruments In actual cruising operation, however, the climb and power are regulated indirectly through control of velocity and r p m or manifold pressure. In this way it is possible to control the cruising climb and glide in a manner consistent with the cruising charts for the level flight condition.

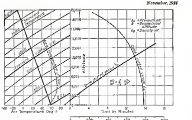


Fig 34: Flight test results in a 75 per cent power, low-pitch climb Rate of climb uses the density altitude scale. (Douglas DC-2).

Climb test procedure

A complete flight test on climb at the cruising limit output of the engine includes climbs at various speeds while the engine limits are maintained by means of the constant-power engine curves. Data are recorded at sufficient intervals of time to enable construction of an altitude versus time curve, from which is calculated the rate of climb The following data should be recorded at approximately 1,000-ft. intervals except as noted

1 Indicated velocity
2 Atmospheric temperature.
3 Pressure altitude (record at close intervals)
4 Time (record at close intervals or use barograph)
5 Absolute intake manifold pressure.
6 Engine revolutions.
7 Carburetor air temperature.
8 Airplane weight (at beginning of each climb)

Additional data recommended

9 Exhaust back pressure.
10 Wet and dry bulb readings.
11 Mixture control.
12 Head temperatures etc.

The mathematical expression for the true geometrical rate of climb $\left(\frac{dh}{dt}\right)$ in the ft -lb, sec system is,

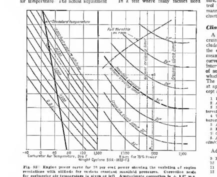


Fig 33 Engine power curve for 75 per cent power showing the variation of engine revolutions with altitude for various constant manifold pressures. Correction scale for carburetor air temperature is given at left Approximate correction is + 1 0" m p for each 40 deg. F. carburetor air temperature above standard.

Example for 11,000 ft. pressure altitude, 75 deg F carburetor air temperature, 28 8 in. hg, the engine revolutions are 1,880 The example is shown by the numbered points connected to each other by the dashed lines.

$$(8)\quad \frac{dh}{dt} = \frac{1}{\rho g}\frac{dp}{dt}\ \text{ft. per sec.}$$

$$= \frac{27\,080}{\sigma}\frac{d\left(\frac{p}{p_o}\right)}{dt}\ \text{ft. per sec. (where } t \text{ is in minutes)}$$

The notation is standard.

A simplified expression which is convenient because of the use of the direct altimeter reading gives,

$$(9)\quad \frac{dh}{dt} = \frac{T}{T_s}\frac{dh_p}{dt}\ \text{(where } h_p = \text{pressure altitude)}$$

This relation follows from the fact that the change in pressure, hence pressure altitude, is reduced in inverse proportion to the air density or air temperature. The ratio of the absolute air temperature to standard is often sufficiently close to constant through a climb to permit the use of a fixed value of $\frac{T}{T_s}$ in the reduction of the climb, for $\frac{T}{T_s}$ is constant throughout a climb

$$(10)\quad \frac{dh_d}{dt} = \frac{dh_p}{dt}\ \text{(where } h_d = \text{density altitude)}$$

This relation is approximately correct when no temperature inversion is present; $\frac{dh_d}{dt}$ and $\frac{dh_p}{dt}$ will differ when the variation from standard temperature changes with altitude.

Rate of climb curves

The true rate of climb in measured distance at constant engine power and indicated velocity depends upon density alone, hence is plotted against density altitude as shown in Fig 34 where the flight test results for the maximum rate of cruising climb are plotted Likewise r p m and indicated velocity vary with density altitude. The true geometrical rate of climb at constant engine power can therefore be plotted against density altitude for fixed values of the various related characteristics Reduced results are shown in Fig 35 Fig 36 shows the general form of chart for the cruising climb which can be constructed from a thorough test of 75 per cent power climbs at various velocities The forms of the constant r.p.m and constant rate of climb curves have been estimated to illustrate the general relationships between the r.p.m. indicated velocity, and rate of climb Fig 36 is recommended for piloting control of cruising climb

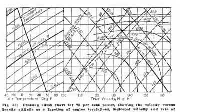


Fig 36: Cruising climb chart for 75 per cent power, showing the velocity versus density altitude as a function of engine revolutions, indicated velocity and rate of climb The climb is controlled by regulating indicated velocity and engine revolutions. The above curves have been estimated from one test to illustrate the general types to be expected. (Douglas DC-2, low-pitch propeller setting)

Example at 9,500 ft pressure altitude and 50 deg F temperature a 75 per cent power climb is obtained at 128 m p h by flying at 104 m p h indicated velocity and setting engine revolutions to 1,885 r p m The rate of climb is then 640 ft. per minute Numbered points and dashed lines with arrows illustrate the example

It must be clearly understood that the plotting of rate of climb at constant power versus density altitude is distinct from the usual full-throttle tests The fact that constant power climb varies with and is plotted against density altitude serves to show that the density altitude can hardly be the correct altitude for plotting full throttle climb, since full throttle power is not constant but varies with temperature at the same density altitude The full throttle climb as well as full throttle level speeds are used so seldom in actual commercial operation and military flying that it is believed unnecessary to consider the full-throttle climb except as an emergency condition

Controlled descent

The descent into the terminal point on the scheduled run should be carefully controlled. This descent is of even longer duration than the climb because of the general experience that passengers suffer discomfort at rates of descent greater than about 400 ft per minute. A cruising power glide from 14,000 ft. will require a minimum of 35 minutes and will cover about 120 miles, while the 75 per cent power maximum climb will require only about 22 minutes It is essential then that the descent be controlled as a part of the cruising flight, and that cruising power therein be maintained as in other portions of the flight.

The controlled descent converts what is often considered a necessary penalty at the end of a flight into a means of retrieving in a large measure the time lost while climbing The rate of change in potential or "height" energy into kinetic energy gives in effect added thrust horsepower for propelling the airplane. It is of interest to note that the

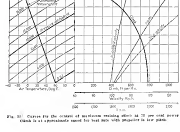


Fig 35 Curves for the control of maximum cruising climb at 75 per cent power Climb is at approximate speed for best rate with propeller in low pitch

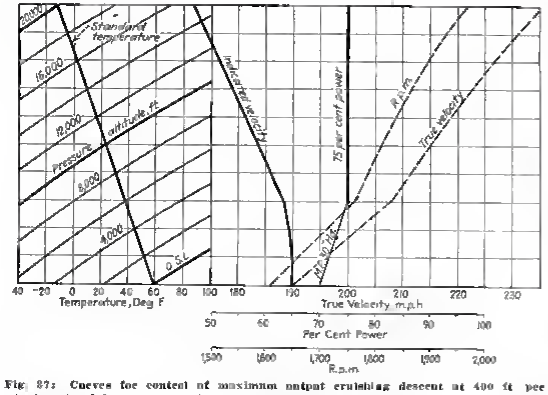


Fig. 37: Curves for content of maximum output cruising descent at 400 ft. per minute rate of descent. Propeller is set in high pitch. (Results obtained from flight test on Douglas DC-2)

400 ft. per minute maximum descent contributes 218 thrust horsepower, or about 275 effective brake horsepower, to the bi-motor transport for which charts are here presented. This power amounts to approximately 19 per cent of the rated engine power. In a 75 per cent power glide at 400 ft. per minute descent, the airplane will develop the speed normally achieved in level flight at 94 per cent of the rated maximum power. Thus at 14,000 ft. the normal velocity of 205 m.p.h. will increase to about 225 m.p.h., while 191 m.p.h. at 8,000 ft. increases to 210 m.p.h. This considerable increase in velocity over the duration of the descent largely compensates for the loss in velocity during the climb. Hence for trips of any considerable length it will be found that there is an appreciable but not large difference between the overall 'trip' cruising velocity and the level flight cruising velocity at the same power.

The cruising descent is, of course carried out with high pitch propeller setting. It is generally recommended that the rate of descent be kept as close to the 400 ft. per minute limit as possible, although a longer, flatter angle of decline may be found desirable in certain cases.

Descent tests

The characteristics in the descent are obtained through flight tests in much the same manner as the data on climb are obtained. In the test the approximate rate of descent is maintained by means of a rate-of-climb indicator and the power is maintained by means of regulation of the throttle according to the constant-power curves of Fig. 32 or 33. The same data are recorded as previously listed for the climbing test.

The data are reduced through use of the rate-of-climb equations since the descent is obviously only a negative climb in principle. Hence the true geometrical rate of descent and the corresponding engine characteristics for the given constant power depend upon air density, and may be plotted against density altitude.

The results of flight tests on a 75 per cent power cruising glide are plotted in Fig. 37. It appears most consistent to maintain the same cruising power in the descent as in level flight, since there is no justification for maintaining maximum cruising power as in the climb. It is believed that the 400 ft. per minute rate of descent should be accepted as the general condition for all glides. A complete test on the cruising power glide for cruising operation would then plot the velocity and r.p.m. for various percentages of engine power and 400 ft. per minute descent. Fig. 38 illustrates the general nature of such complete tests on the cruising glide of which Fig. 37 shows the results for 75 per cent power only. The similarity of Fig. 38 to the level flight cruising chart is worthy of note. Fig. 38 is recommended for piloting control of the descent in cruising operation.

The charts for the cruising descent and climb which have been developed can be used by the pilot for regulating his entire cruising flight. The desired power and rate of climb and descent are controlled by adjusting the engine r.p.m. and the indicated airspeed. In the level flight portion of the trip either indicated airspeed or r.p.m. is sufficient to define the power and speed. Since the density altitude is used for setting all of these characteristics, the density altitude conversion scale is included on all charts. For the conditions that limit cruising operation, it follows that the density altitude and factors whose variation depends upon density are most suitable for control.

It should be noted that appreciable changes in weight, propeller setting, etc., will require modification of the preceding results, which modification can be obtained either through calculation or additional flight tests. Small changes can usually be neglected.

For cruising operation and the establishment of schedules, the time consumed in each portion of flight must be considered. The overall scheduled time can be calculated from charts now developed for climbing, level, and descending flight.

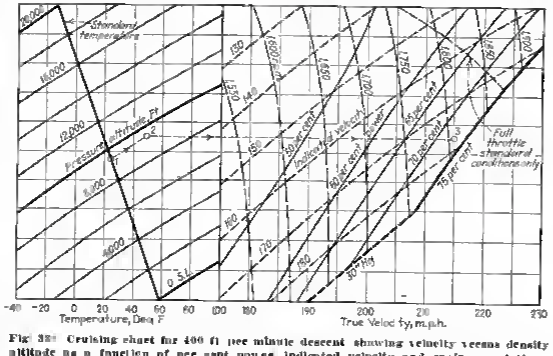


Fig. 38: Cruising chart for 400 ft. per minute descent showing velocity versus density altitude as a function of per cent power indicated velocity and engine revolutions. The descent is controlled by indicated velocity and engine revolutions. The above curves have been estimated from one test to illustrate the general types to be expected. (Douglas DC-2; high pitch propeller setting).

Example: at pressure altitude of 9,500 ft. and air temperature of 50 deg. F. 215 m.p.h. is obtained with 177 indicated velocity and 1,810 r.p.m. The percentage of rated power is then 73. Numbered points and dashed lines show example.

Scott and Black

ONE

Paramentier and Mell

TWO

Pangborn and Tuner

THREE

MacRobertson Score Sheet

Post mortem material for a winter's debating

THERE ARE a number of yardsticks by which the success of an international air race might be measured. Its monetary cost might be weighed against the value of its stimulus to technical progress. The effect of its overall safety record on the general public's attitude toward air travel might be estimated. There are factors of sportsmanship and management and the size and importance of the entry list that might be discussed. But by and large, the real test of greatness for an international contest will always be the number of competing nationalities which feel satisfied at its outcome. And the MacRobertson race for all its record breaking, accomplished nothing more remarkable than this. It distributed major triumphs to no less than three contesting countries, some two more than any comparable aeronautical event had ever sent home in even approximate satisfaction. To Britain went first place and an unparalleled racing victory. To American designers an armful of tributes for their supremacy in the transport field. To the Dutch, a world-wide notice of their bid for top rating for their route from Europe to the Far East. Only the Irish were frustrated and to them still remained a chance for a spectacular moral victory.

But if some of the major problems were pretty well worked out, a host of minor ones remain to vex the air-minded of all nations. All the French, Italian, and German entries were missing, and there were enough absent Americans, English and Australians to cut the final number that turned up at Mildenhall to 21 from an original entry list of 64. What could Wiley Post have accomplished in his supercharged ship? What could Kingsford Smith have done with his experience of the route? Would Gatty in his Douglas entry have beaten the Comet? Then there is that delicate problem of the race committee's rulings on the Fitzmaurice Bellanca and the fuel allowance of the Boeings and some others. Was the committee acting for real safety in cutting down reserve range to insure full load take-off and landing safety? Dump valves are after all well proven devices.

As to the actual contestants, what could the K.L.M. Douglas have achieved in a full out race? Placing second in such a contest while carrying three passengers, baggage, food and 30,000 letters, and making regular stops along the K.L.M. air route to Batavia is one of the most astounding demonstrations of air transport performance on record. Incidentally, how should one evaluate the DeHavilland Comet and its engines? One Comet entry won. Another placed a poor fourth. The third was forced out at Karachi. All of them had engine trouble. But then so did the majority of the rest of the contestants somewhere along the course.

Already, too, we have heard from an expert on navigation on the subject of some of the off-course wanderings of most of the leading contestants. The teams of Scott and Black, and Jones and Waller were forced to land short of Baghdad. Turner and Pangborn narrowly missed disaster

when they were lost after overshooting Allahabad. The K L M. Douglas was forced down in a rainstorm on the last leg. And the handicap contestants scattered badly the first day. Just what were the particular errors involved in each case are not yet known, and course deviations were certainly less than might have been expected in view of the scarcity of radio directional facilities and course marking beacon lights. But the results might well have been shifted had there been no such incidents.

The results of the handicap race are of course not yet available. The rules permit contestants nineteen days to complete the course, and until that time has elapsed no one can tell whether the event has been won by one of the planes to reach Melbourne in three or four days or by some efficient straggler who takes eighteen and a half to complete the task. General interest in the handicap part of the MacRobertson program seems to have pretty well died down, unfortunately, if one can judge such interest by the amount of space allotted in the newspapers. As a builder of the entry list and pre-race interest the handicap race was an undoubted success, but its chief discernible function since the start has been to confuse several issues in the popular mind. Unfamiliar with the rules or the principle of handicaping, many people have been astounded to see what were apparently contestants in the same race strung out all the way from Paris to Darwin. The result has been to decrease the effectiveness of the feats of the speed contestants as aeronautical propaganda, and to detract seriously from the very creditable efforts of the handicap fliers.

Scott and Black

C. W. A. Scott and T. Campbell Black, flying a DeHaviland Comet with two Gypsy engines were second to Baghdad, first to Allahabad, Singapore, Darwin, Charleville, and into Melbourne.

Left Mildenhall at 6.34 a.m. Saw nothing of Europe until four hours after crossing North Sea. Encountered low clouds and rain over Turkey. Lost bearings over Irak, landing at RAF field at Kirkuk where they took on 20 gal. of gasoline before proceeding to Baghdad. Passing the Mollisons as they flew over Karachi, took lead never to be headed. On their non stop flight across the Bay of Bangal, had "an appalling trip," being forced by 1,400 miles of bad weather to fly just above the surface of the sea. Landed fast at Singapore, almost turning over. Most sensational leg of their trip, to Darwin from Singapore. Encountering low visibility throughout, much of it was flown by instrument or just above the water. Half way across one engine failed, but plane limped into Darwin at 11.08 p.m. Sunday, setting a new London to Australia record of 52 hours and 35 minutes (former record 109 hours, 12 minutes). Repairs on engine cost them several hours in Darwin, and continued trouble caused them to turn back to Charleville after their first take-off from that point. Final total time for the course was 70 hours, 59 minutes, 50 seconds. Times of their arrivals and departures are as follows: Left Mildenhall at 6.33 a.m. Saturday, left Kirkuk after a short stop at 8.15 p.m. Arrived Baghdad 9 p.m., left 9.33 p.m. Arrived Allahabad 9.15 a.m. Sunday, left 10.15 a.m. Arrived Singapore 10.23 p.m., left 11.42 p.m. Arrived Darwin 11.08 a.m. Monday, left 1.55 p.m. Arrived Charleville 10.40 p.m., left 12.59 a.m. Tuesday. Arrived Melbourne 5.33 p.m. [Times given throughout this article are Greenwich Mean Time, five hours earlier than Eastern Standard Time.]

Parmentier and Moll

K. D. Parmentier, J. J. Moll, C. Van Brugge, Thea Rasche, and two other passengers, in a Cyelone-powered Douglas DC-2, were third to Baghdad, second to Allahabad, Singapore, Darwin Charleville, and Melbourne.

The log of this astounding flight, possibly the most interesting of all, is unfortunately the one least completely available from our sources. These items we are sure of. Landed at Rome about 10.30 a.m. Saturday. Passed over Athens at 2.15 p.m. Returned, landed, took off again at 3.53 p.m. Landed at Alleppo just before 8 p.m. Landed at Baghdad at 11.11 p.m. Left Allahabad 3.11 p.m. Sunday, after losing some time when they had to turn back to pick up a passenger who had been inadvertently left behind. Landed at Calcutta, Rangoon, and Alor Star. Landed at Singapore, taking off 32 minutes later. Landed at Batavia, Rambang, Koepang, Darwin and Charleville. Were forced down at Albury by a severe thunderstorm. Took off at 11.55 the following morning. Arrived Melbourne 12.52 p.m. Total elapsed time, 90 hours, 18 minutes, 51 seconds.

But to be added to these are several stops between Baghdad and Allahabad and possibly one or two more. At least eighteen stops were made along the way, most of them at regular ports of call for the K.L.M. airliners.

Turner and Pangborn

Roscoe Turner and Clyde Pangborn, flying a Boeing 247 Transport with two P&W Wasps, were fifth at Baghdad, fourth to reach Allahabad, third at Singapore, Darwin, Charleville, and Melbourne.

Made ten stops in all before reaching Melbourne, Athens, Baghdad, Karachi, Allahabad, Alor Star, Singapore, Koebang, Darwin, Charleville, and Bourke. On first day saw nothing of Europe until reaching the Alps flying at a very high altitude. Flight from Karachi to Allahabad took ten hours instead of expected five after overshooting Allahabad by 200 miles. Landing, finally achieved with very little fuel left, was made cross-wind. Delayed slightly in Darwin to check oil line. Forced to make an emergency landing at Bourke 400 miles from Melbourne to check lubricating system. Total time for trip 93 hours, 6 minutes. Total on ground during stops 11 hours 30 minutes.

Jones and Waller

Cathcart Jones and Kenneth W. Waller, flying a DeHaviland Comet with two Gypsy engines, were sixth at Baghdad, fourth to leave Allahabad. Fourth into Singapore, Darwin, Charleville, and Melbourne.

Another log difficult to reconstruct from early reports. But did lose their bearings on the way to Baghdad, landed 250 miles off their course, then made Baghdad at 5.12 a.m. Sunday with very little fuel remaining. Proceeding without incident to Allahabad, they were forced to turn back there when their variable pitch propeller refused to assume its high speed pitch position. As the Douglas and the Boeing were finishing at Melbourne, were flying over Batavia. Finished Thursday at 4.54 p.m. Total time 118 hours, 20 minutes. The following Saturday morning took off on a return trip to London in an attempt at the Australia-England and the round trip records.

The Mollisons

Capt. James A. and Amy Johnson Mollison, flying a DeHaviland Comet, with two Gypsy engines, were first to Baghdad, fifth to Allahabad. Out of race at Allahabad.

Flew non-stop to Baghdad at great height to avoid bad weather, but averaging 200 m.p.h. Arrived at 7.10 p.m. Took off again at 8.48 for Karachi. Arrived Karachi 4.56 a.m. Sunday, thus reducing record from England to India to 22 hours, 26 minutes, from previous mark of 50 hours. On taking off, found that their landing gear was jammed, returned to Karachi for repairs. Held up there by repairs and bad weather until 9.05 p.m. losing 16 hours, 20 minutes. Left Karachi for Allahabad, stopped at Jubbulpore, arrived Allahabad 5.28 a.m. Retired from race at Allahabad because of intermittent engine trouble.

Asjes and Geysendorffer

D. J. Asjes and C. J. Geysendorffer, flying a Pander S4 with three Wright Whirlwinds, were fourth at Baghdad, third to reach Allahabad. Out of race at Allahabad.

Landed at Athens at 4.30 p.m. Took off at 5.15 p.m. Arrived Baghdad just after 1 a.m. Left Baghdad at 1.45 a.m, passing the Mollisons at Karachi. On approaching Allahabad found that their retracted landing gear would not return to landing position. Landed on bottom of fuselage without injury to passengers.

NEWS OF THE MONTH

★ Federal Aviation Commission . . . Representatives of the industry testify at public hearings.

★ Services . . . Army carries out more Baker Board recommendations.

★ D. of C. . . . Hammond Aircraft Corporation wins small plane competition.

★ Federation Aeronautique Internationale . . . 34th conference at Washington.

★ Air Mail and Transport . . . Airlines speed schedules with new equipment.

★ Foreign . . . South Atlantic mail operations progress . . . Italy breaks two world records.

Toward an air policy

DURING its first four weeks of public hearings, the Federal Aviation Commission received verbal and written testimony from many leaders in the aeronautical field. First to be heard were representatives of the Bureau of Air Commerce, including Secretary of Commerce Roper, Assistant Secretary Ewing Y. Mitchell, Director Vidal, and several of his assistants. They submitted a five-point program calling for the creation of a permanent aviation authority with full control over all phases of aeronautics; development of lighter than-air trans-oceanic transportation; federal encouragement of the industry until it becomes self-supporting, including adequate mail pay for domestic and foreign airlines; a $20,000,000 appropriation for use within the next two years in building airports, cooperating with states on a dollar-matching basis; and a campaign to bring about widespread use of aircraft by private owners.

Speaking for the National Advisory Committee for Aeronautics, Dr. George W. Lewis, Director of Aeronautic Research, agreed with Department of Commerce officials that domestic and foreign transport systems should receive government subsidies, to be decreased as other earnings permit. He recommended the construction by the government of two experimental rigid airships for intercontinental commercial service and governmental encouragement of the operation of large seaplanes for trans-oceanic and intercontinental use. Control of commercial aviation should be under the Department of Commerce, Dr. Lewis said. He was opposed to consolidation of military and civil aeronautics.

Postmaster General Farley, in a formal statement presented to the commission by Second Assistant Postmaster General Harllee Branch, said that any aeronautical policy adopted by the government should leave with the Post Office department full authority to designate air mail routes, award contracts, and prescribe schedules. In questioning Mr. Branch on the new mail contracts, the Commission said that some of the contractors had indicated that they would be unable to continue indefinitely under the present low rates accepted by transport companies in the hope of getting a later readjustment from the ICC. In answer, Mr. Branch testified that the Post Office department did not believe that the ICC had the authority to revise rates upward. The Post Office department has no choice but to award a contract to the lowest bidder, even if equipment used by a higher bidder is superior, he said.

Centralized control of aviation through a new department of aeronautics with jurisdiction over all military and civil flying was recommended by Howard E. Coffin, one of the earliest flyers in this country, and a member of the Morrow Board of 1925. Hiram Bingham, former president of the National Aeronautic Association, and also a member of the Morrow Board, joined with other witnesses in urging the establishment of services to Europe and the Orient with lighter-than-air craft, built and financed by the government. He recommended governmental appropriations for the maintenance of flying schools, for improvements at airports, and for payment of bonuses to investors of safety and speed devices.

Without exception, officials of the air transport systems urged that the regulation of the industry be placed in the hands of a permanent non-partisan aviation commission with authority to establish and regulate mail, passenger, and express rates. Among them were Ernest R. Breech, president of North American Aviation, L. D. Seymour, president of American Airlines, C. B. Monro, president of Pennsylvania Airlines & Transport Company, A. A. Patterson, president of United Air Lines; Albert Frank of National Parks Airways, Paul Braniff of Braniff Airways. It was pointed out that the experience of the last two years had shown that a multiplicity of regulatory authorities was not only extremely expensive to the operators, but had brought about an uncoordinated situation harmful to all concerned. The operators were united also in their criticism of the present Air Mail Law, which they described as unfair, contradictory, and discriminatory. Emphasizing the fact that present rates of pay for mail carriage are too low to cover operating costs, they claimed that within a few months their cash resources will be so reduced that it will be impossible to carry on without extensive refinancing.

Representatives of the Independent Aviation Operators, led by Oliver L. Parks, president, were in accord with mail contractors in protesting the provisions of the Air Mail Law, and in recommending the creation of a permanent air commission. Members of the National Association of State Aviation Officials also went on record as being in favor of a permanent regulatory board for the industry. They urged federal cooperation with states in an airport building program.

In his testimony, Col. Charles A. Lindbergh appealed for an opportunity for airline officials whose names are on the administration's so-called blacklist to clear their records through the courts or otherwise. These men are among the most efficient and experienced men in the industry, Colonel Lindbergh said,

Calendar

Nov. 13—Sixteenth Annual Armistice dinner and show, auspices of Aviators Post of American Legion, Ritz-Carlton New York City.

Nov. 11—Treasure Hunt, starting from Hotmes Airport, Long Island, N. Y.

Nov. 16-Dec. 1—Exposition Internationale de L'Aeronautique, Grand Palais, Paris, France.

and their uncertain status is one of the most disturbing factors in the present aviation set-up. Questioned on the feasibility of establishing transoceanic air mail routes, he expressed the opinion that aircraft already developed in this country are suited to such service, and that operations could be inaugurated within a few months. He urged the adoption of a government program that would give stability to the industry for a period of years and predicted a tremendous increase in airline activity if such a program were forthcoming. He too favored the establishment of a permanent commission offering centralized control over commercial aviation.

Government appropriations for experimental work in developing low-priced planes as a means of stimulating private flying were recommended by representatives of the Private Flyers' Association. A national program for the improvement of present landing field facilities was also urged. The association was another of the many to advocate a permanent commission.

Other witnesses heard were General William Mitchell, commander of American Air Forces during the World War; Col. Edward V. Rickenbacker, World War ace; W. R. Gregg, Chief of the U. S. Weather Bureau; Stanley C. Kennedy, of Inter-Island Airways, Honolulu; Thomas B. Doe, vice-president of Sperry Corporation, and former president of Eastern Air Transport; I. I. Sikorsky, Sikorsky Aviation Corporation; Commander Frank Hawks, World War flyer; Dr. Karl Compton, president of the Massachusetts Institute of Technology.

GHQ Air Force

Last month President Roosevelt approved the Baker Board report, authorizing an ultimate quota of 2,300 first-class aircraft for the Air Corps. With Presidential approval, the War Department proceeded to carry out other Baker Board recommendations. Most important change in the Air Corps set-up was the organization of a General Headquarters Air Force, to function under the direct command of Chief of Staff MacArthur. As the main tactical element of the country's aerial defense, the GHQ Force will consist of at least 1,000 bombing, pursuit and attack planes in five wings, based at Army fields on the Atlantic and Pacific Coasts and in the Middle West. Headquarters will be at Langley Field, Virginia. Non-fighting units of the Air Corps, including observation squadrons, remain under the command of the Corps area commanders. Under the new arrangement, Chief of Air Corps Foulois relinquishes control of most of Corps flying activities. He continues to have charge of schools, training and procurement as contemplated in the Baker Board report which stated that the primary function of the Chief of Air Corps should be to direct efficiently the business and commercial side of the Air Corps development and procurement problems. No one has as yet been named as commander of the force under General MacArthur.

To check up on the efficiency of Air Corps personnel, the War Department ordered tests to determine the flying ability of all officers with more than fifteen years' service. All generals, colonels, majors, and a majority of the captains will be examined. Those disqualified from further flying will be assigned to ground duty, transferred to other branches of the service, or retired. There are 3 generals, 9 colonels, 31 lieutenant-colonels, 81 majors, and 362 captains in the Air Corps. Elimination of any found unfit for flying would make way for the promotion of men of junior rank.

Ground school training and twenty hours of air experience will be given to all West Point cadets of the first and third classes at Mitchel Field, L. I. In order that the maximum number of cadets may participate in each flight and have varied training in navigation, bombing, gunning and observation, the flights will be carried out in bombers. Said Secretary Dern in announcing the new training, "I ultimately hope to see every graduate of West Point an accomplished air pilot."

To improve the condition of unit training the War Department has changed the composition of the Air Corps Board which formulates uniform tactical doctrines for all Air Corps units. Permanent members, numbering not less than five or more than eight, will be designated by the Chief of Air Corps and will give full time to their duties in connection with the board. In the past, the work of the board has been done by officers performing primary duties as instructors at the Air Corps Tactical School. Ex officio members of the board will be, as formerly, the commandant and the assistant commandant of the Air Corps Tactical School.

Light plane contract award

Hammond Aircraft Corporation of Ypsilanti, Mich., was the winner of the competition sponsored by the Bureau of Air Commerce to procure equipment for its inspectors, and at the same time to encourage the development of an economical, safe airplane for the private owner. The bureau awarded Oct. 18 a contract for fifteen of the Hammond planes (see Flying Equipment), page 375, for full technical details), with the option of taking five more, at $3,190 apiece. Delivery of the first plane must be made within five months, and delivery of the remainder within four months after the Bureau's acceptance of the first. The Bureau originally planned to purchase 25 planes from the winner of the competitive bidding but reduced the number so that a portion of the funds set aside for the purpose will be available for experimentation with designs submitted by other manufacturers.

F.A.I. conference

Delegates to the 34th convention of the Federation Aeronautique Internationale governing body for world aviation, met in Washington, Oct. 6-11 as guests of the National Aeronautic Association, its U. S. affiliate. Leaders of 22 of the 34 national clubs represented in the Federation were present, including Prince Bibesco of Roumania, its president, Paul Tissandier of France, its secretary-general, and Louis Bleriot. United States delegates were Godfrey L. Cabot, Hiram Bingham, F. Trubee Davison, Edward P. Warner. Changes in existing regulations were promulgated to promote the development of private flying throughout the world. Upon the proposal of Austria it was decided that each country would prepare a map for its official Air Guide showing the exact position of airports and prohibited areas. Egypt urged that as much territory as possible be opened up for air touring, pointing out that it has already removed all such restrictions except for the Suez Canal. Yugoslavia recommended relaxation of restrictions on the use of cameras and radios in private aircraft.

International regulations concerning trials for records were also revised. Speed records must be timed henceforth by electro-photographic methods with a tolerance of not more than 0.01 second. Official credit for a new speed record will be allowed only if the existing record is bettered by at least 5 m.p.h. For altitude records a change in rules was considered to require the carrying of an automatic pressure-temperature-humidity recording unit, instead of the simple barograph now specified.

As proposed by Egypt last year the Federation was granted official designation from the League of Nations as the official authority on problems relating to international private flying.

Before adjournment the Bulgarian Aero Club was admitted to membership and Prince Bibesco was unanimously re-elected president. The next Congress will be held in Belgrade, Yugoslavia in October, 1935.

[We are indebted in a large part for the above material to Guirgis Awadalla, secretary of the Department of Aviation in Egypt and delegate from his country to the F.A.I. Conference.—Ed.]

McAdoo heads N.A.A.

At the annual meeting of the National Aeronautic Association Oct. 11-13, Senator William G. McAdoo, who has long been an enthusiastic plane owner, was elected president. He succeeds former Senator Hiram Bingham, holder of the office for the past two years. Major James H. Doolittle was elected vice-president and Mrs. Louise Thaden secretary. John F. Victory was reelected treasurer. The following governors at large were chosen: Orville Wright, Godfrey Cabot, Porter Adams, William P. MacCracken, Jr., and Frank Hitchcock. A resolution was adopted asking Orville Wright to restore to this country the plane in which he and his brother made the first successful flight at Kitty Hawk, and which is now in the New Kensington Museum at London. A committee of five was appointed to confer with Mr. Wright, including Edward P. Warner, chairman, Frank Hitchcock, Dr. George W. Lewis, Earl N. Findley, Capt. William J. Tate, in whose house the Wrights lived while they were preparing for their flight.

New planes for old

Airlines progress toward early inauguration of faster schedules as orders for new high speed transports are filled. On the West Coast American Airlines took delivery on the first of ten Douglas transports to be placed in service within the next two months. Its $2,500,000 re-equipment program includes besides the Douglases, ten Curtiss Condors and ten Vultees, some of which are already in service. The new planes are replacing all of the company's older three-engined equipment. Six of the new Condors are the 12-passenger sleeper planes. More than 4,000 revenue passengers have been carried by American Airlines' six sleepers now operating between Los Angeles and Dallas and between Chicago and New York since the services were inaugurated in the early summer.

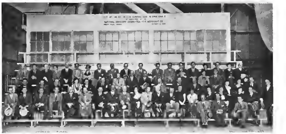
Eastern Air Lines will put into service eight new Douglas planes by the beginning of next year. In addition its Curtiss Condors will be altered to give higher speeds.

Record breaking flights marked the delivery of the first of six Douglas transports to Pan American Airways. One of the three intended for Panagra's service between Lima and Santiago, Chile, was delivered Sept. 13. The plane made the 1,700 mile flight from Cristobal, C. Z., to Lima in nine hours, 35 minutes. The previous record was nineteen hours. Another new Pan American Douglas, the San Martin, cut two hours, 35 minutes from the Santiago to Buenos Aires run on its first flight over the trans-Andean mail route Oct. 11. Elapsed time was four hours, 55 minutes.

Faster passenger service from Philadelphia to points in the Middle West and Pacific Coast resulted from recent schedule changes by United Air Lines. Thus from Philadelphia to Detroit was

ACME

F. A. C. IN EXECUTIVE SESSION
Colonel Lindbergh appears before the President's air policy board. Members of the Commission from left to right are Jerome C. Hunsaker, Franklin H. Lane, Jr., Chairman Clark Howell, Edward P. Warner, Albert J. Berres. Col. J. Carroll Cone, secretary, is standing.



N. A. C. A. HOSTS TO F. A. I.
After visiting Kitty Hawk, scene of the Wrights' early experiments, members of the 34th congress of the Federation Aeronautique Internationale inspect the latest in aeronautical research equipment at Langley Field

cut to four hours, and passengers leaving the former city at eleven to the morning can reach any major West Coast city the next morning at breakfast time. On the San Francisco-Los Angeles run, United added another round trip, raising the number of daily flights to seven

Canadian mail

With a new high speed Vultee transport on American Airlines' route between Montreal and New York, the run is now made in one hour less than formerly. The northbound trip takes two hours, 50 minutes, the southbound, three hours. Over this route next spring the company plans to expedite delivery of European mails arriving via Canadian Pacific steamers by making connections at Montreal with the Canadian Airways Rimouski service. Since 1928 Canadian planes have met incoming liners at Rimouski and speeded delivery of mail to Montreal by 24 hours.

The Canadian Government has granted permission to Pan American's subsidiary, Pacific Alaskan Airways, to use its air facilities at White Horse, Yukon Territory, as part of an extended Alaskan service. The initial plan is to establish a service from Fairbanks, present Pacific Alaskan headquarters, to Juneau, in the Alaskan panhandle. White Horse, though in Canadian territory, lies on the most favorable air route between the two cities. Ultimately, a further extension to northwestern United States is looked for.

Terminus shifted

The eastern terminus of TWA will be moved from Newark Airport to Floyd Bennett Field, New York City's municipal airport in Brooklyn, some time this fall if the company's negotiations with the city and the Post Office department come to a successful conclusion. Floyd Bennett is about 15 miles further from Los Angeles than Newark and the adjustment of the company's air mail contract to provide additional pay for the increased mileage is now under consideration by the Post Office department. Although the transportation of passengers from the Brooklyn airport to Manhattan now requires approximately the same time as the trip from Newark to New York, the city hopes eventually to extend the Long Island Railroad tracks to the field, bringing it within fifteen minutes of Pennsylvania Station.

TWA suit denied

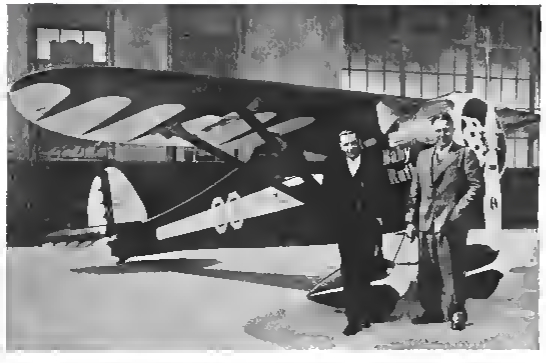
The attempt of Transcontinental & Western Air to nullify Postmaster General Farley's cancellation of its air mail contract last February was finally defeated Oct. 15 when the Supreme Court refused to consider the company's appeal. The case was first heard in March before the Federal Court of the Southern District of New York, which denied the injunction to restrain Mr. Farley and Postmaster Kiely of New York from executing the cancellation order on the grounds that the suit was essentially one against the government which cannot be sued without its consent. The Second Circuit Court of Appeals likewise dismissed the suit. It ruled, first, that Postmaster General Farley had never been properly served with the complaint in the action, and the case therefore should have been dismissed for lack of jurisdiction; and second, that the United States was a proper party to the action. The Supreme Court refused to review the decisions of the lower courts.

It is still possible for Transcontinental & Western Air to file suit for damages in the U. S. Court of Claims, as provided for in the Air Mail Law of 1934, which states that any former contractor may bring suit against the government within a year after the passage of the bill.

Meanwhile, United Air Lines' four transport subsidiaries (Boeing Air Transport, National Air Transport, Pacific Air Transport, Varney Air Lines) carried their suit against Postmaster General Farley to the U. S. Court of Appeals for the District of Columbia. A lower D. of C. court had previously dismissed the case on the grounds that it was essentially against the United States and the government had not consented to be sued.

Wages and rates

As a result of charges filed by the Air Line Pilots' Association and Bowen Air Lines, Karl A. Crowley, Solicitor for the Post Office department, ordered Long & Harmon, air mail contractors on the Amarillo-Brownsville, Tex., route, to appear at a public hearing Oct. 25 to show cause why their contract should not be cancelled. David L. Bencke, president of the ALPA, claimed that the company had failed to comply with the pilots' wage scale fixed by the National Labor Board last May. A provision in the Air Mail Law states that all contractors must pay wages fixed by the Board. Bowen Air Lines stated that Long & Harmon had been carrying passengers at an unreasonably low rate in violation of the Air Transport Code of Fair Competition.



MACROBERTSON MONOCOUPE

Jack Wright and John Polando with their Lambert Monocoupe, equipped with Warner Super Scarab and specially streamlined for high speed. The plane was the only American entry in the MacRobertson handicap race.

Transatlantic mail

Several more successful south Atlantic crossings have been carried out in the past few weeks by the French on their mail service between Paris and South America. The Croix du Sud (Latecoere flying-boat, four Hispano-Suiza engines) left Natal, Brazil, Sept. 19, arrived at Dakar 23 hours, 29 minutes later, to complete its sixth crossing. Its mail load, transferred to another plane, was delivered at Paris 53 hours, 30 minutes after leaving Natal. Mail carried by the Arc-en-Ciel (Couzinet mail plane, three Hispano-Suizas) on its sixth crossing Sept. 25 reached Paris only 48 hours, 34 minutes after leaving Natal, a new record. Averaging 131 m.p.h., the Arc-en-Ciel flew from Natal to Porto Praia in the Cape Verde Islands in thirteen hours, three minutes. On the next crossing Oct. 1, the ship flew from Villa Cisneros on the West Coast of Africa to Natal via Porto Praia. Some days later, it proceeded down the coast to Rio de Janiero. After an eighth crossing scheduled for Oct. 23, the plane was to be taken out of service for a major overhaul.

A new cooperative service, connecting with Air France planes flying South American mail down the African coast, was started from Lisbon to Tangiers by Aero Portuguesa Oct. 20.

Meanwhile the Germans maintain their regular mail schedules from Berlin to South American cities, making one flight in esch direction weekly. The second seaplane mothership, the Schwabenland, has been in operation since September, stationed off the African Coast. The first ship, the Westfalen, is on duty off South America. Though basically similar, the Schwabenland has a rotating catapult, while that of the Westfalen is stationary.

7.3 miles a minute

A new international record was established by Italy Oct. 23. Lt. Francesco Agello, leader of the speed school at Desenzano on Lake Garda, flew his Macchi-Castoldi 72 seaplane at the new high speed of 440 m.p.h. The plane was the same one he had used in setting the former world's record of 423.8 m.p.h. April 10, 1933. Recent modifications of the Macchi's power-plant, a Fiat A. S. 6-V, have raised its horsepower to 3,500.

The world's long distance record for seaplanes was also broken by Italy Oct. 19 when a flight of 2,561 miles was made from Monfalcone, near Trieste, to Massaoa, capital of the Italian colony of Eritrea in northern Africa. The seaplane, which is a naval flying boat designed by the firm of Cantieri and equipped with a 750-hp. Isotta-Fraschini engine, made the trip in 26 hours, 25 minutes. The crew consisted of Pilot Stoppani, Navigating Officer Corrado, and Radioman Suraion. The previous record was held by the American flyers, Lt. Comdr. Kneffer McGinnis and Comdr. Marc A. Mitscher for the Navy's mass flight last January from San Francisco to Hawaii, a distance of 2,399 miles.

Balloons

The James Gordon Bennett Cup was won by Poland for the second year in succession at the 22d annual race for the trophy which started from Warsaw Sept. 23. The winning balloon Kosciuszko, piloted by Captain Hynek and Lieutenant Pomaski, traveled 1 331.80 km. (827 miles) in a northeasterly direction and came down in Russia after about 44 hours in the air. Second place also went to a Polish balloon, which covered 1,304.76 km. (810 miles). Belgium placed third and another Polish entry was fourth. The two American entries, the Buffalo Courier Express balloon, and the Navy balloon, placed tenth and thirteenth respectively. There were sixteen participants from eight countries in the contest.

Another balloon flight into the stratosphere in search of data relating to cosmic rays was successfully negotiated Oct. 23 by Prof. Jean Piccard, twin of Auguste, and former member of the faculty at Massachusetts Institute of Technology. He was accompanied and assisted by his wife, also an experienced balloonist. Taking off from Cadiz, Ohio, they reached an altitude of about 10 miles in the course of the eight hour flight. In landing, the balloon descended too swiftly, struck among tall trees, and its 600,000-cu.ft. gas bag was badly torn. The navigators and their instruments were unharmed.

Soaring in the Blue Ridge

An eleven-day meet held by the Soaring Society of America at Big Meadows, Va., late in September opened up another promising site to soaring enthusiasts. Though only two of the eleven days of the meet produced the northwest wind necessary for take-off, 21 hours of soaring were logged by the eighteen pilots participating. In addition to the two Bowlus-duPont sailplanes flown by Lewin B. Barringer and Warren Eaton, there were three Franklin Utility gliders and one two-place Alfaro in use. C. licenses were awarded to John Novak, of the A.B.C. Club, Detroit, and Lloyd Fish and L. Marhofer, both members of the Washington Glider Club. Mr. Eaton and Mr. Barringer executed a formation altitude flight which represented the first attempt at formation soaring in this country. The Virginia site proved itself to have distinct possibilities for the more experienced pilot. It is less suitable for novices because of the numerous small hills in the vicinity.

Industry reports

Best financial returns since 1929 were shown by the 1934 report of the National Air Races. The report lists a net profit of $12,157, with the indication that the sum may be increased when certain bills are collected. Grandstand and field expenses were $65,855; publicity $12,255; operating personnel $24,999, general and administrative expenses $45 000. Total receipts were $241 000. Fully 80 per cent of the income was from ticket sales.

From the Hamilton Standard Propeller Company comes the announcement that its 1,000th controllable pitch propeller has been produced and is scheduled for delivery to the Navy. First made available in the spring of 1933, these propellers are widely used on the transport planes of most of the important commercial airlines throughout the world, and are finding increased usage on military aircraft.

The Hall-Aluminum Aircraft Company, designers and manufacturers specializing in all-metal aircraft, will move from their Buffalo plant to the Keystone factory at Bristol, Pa., recently purchased by Fleetwings, Inc.

PWA has allotted $250,000 to the Coast Guard Air Station at Charleston, S. C., for construction and equipment. The money will be spent for building a hangar, ramp, barracks, and for purchase of radio and other equipment.

Aviation People

• Dr. Hugo Eckener, commander of the Graf Zeppelin, recently arrived in the United States to confer with F. W. von Meister, his New York representative, officials of the Navy Department, and Paul Litchfield, president of the Goodyear Zeppelin Corporation at Akron, on terminal arrangements here for the new Zeppelin LZ 129. Dr. Eckener appeared before the Federal Aviation Commission to discuss the possibilities of a regular North American-German airship passenger service.

• Assistant Director of Air Commerce Rex Martin sailed Oct. 10 for Paris to serve with John J. Ide, European representative of the N.A.C.A. as American delegate to the International Aeronautical Exposition to be held in that city Nov. 16 to Dec. 2. Mr. Martin planned to be on hand at the start of the MacRobertson Race, later to tour France, England, Germany, Italy, and the U.S.S.R. to inspect civil aviation developments. Scheduled return,—Nov. 25.

• $2,500 in cash, a standing offer to enter the Russian air service, and the Order of Lenin which carries with it a pension of 30 gold roubles a month, free transportation on Russian railroads, and membership in the Snotye, the new aristocracy of labor and merit, was the Soviet's recognition of the part played by Clyde Armitstead and William Lavery in the rescue of 102 survivors of the Chelyuskin last April. Messrs. Armitstead and Lavery returned on Oct. 17, via the S.S. Bremen.

• The National Council of Air Corps Associations, at the concluding session of the annual convention at Fort Hayes, elected Maj. William F. Centner, Columbus, president; Maj. M. G. Harbula, Chicago, vice-president; Capt. Alfred D. Hillman, Kansas City, judge advocate; Lieut. William E. Shuttles, Dallas, treasurer; and Capt. William H. Beatty, Birmingham, secretary. Convention city for 1935 is to be Louisville, Ky.

• Recently returned from Europe, Maj. E. E. Aldrin, head of the Aviation Department of the Standard Oil Company of New Jersey, has visited Germany,

France, Italy, England, Holland, Switzerland, and the Scandinavian countries since his departure in August (AVIATION, Sept 1934) In addition to taking an active part abroad in his company's plans for servicing contestants in the MacRobertson Trophy Race, MAJOR ALDRIN represented the Aeronautical Chamber of Commerce of America at the sessions of the International Air Transport Association at the Hague

• United Air Lines has transferred J A ROSE, traffic representative at Sacramento, Cal, to Oakland, Cal. AL EVERETT assumes the managership of operations at Sacramento

• CAMILLE STEIN connected with Northwest Airlines, Inc, since 1926 as combined public relations officer, traffic director, and secretary, has been named a director of that company Miss Stein has the distinction of being one of the few women to serve as director of a commercial airline.

• To MAJ CHARLES E. COX, JR, Indianapolis municipal airport superintendent, goes next year's air safety trophy of the Lincoln National Life Insurance Company Decision was reached at the conclusion of the six-day, 1,500-mile Indiana air tour made by 46 planes EDWARD NEW and Dr. DONALD MUSSELMAN received honorable mention in the

Maj Charles E. Cox, Jr.

safety contest. Homecoming air voyagers were publicly welcomed. JIMMIE MATTERN being among the speakers.

• The Lockheed Aircraft Corporation has announced the appointment of RICHARD VON HAKE, chief engineer under the previous management as factory superintendent to succeed OTTO SANTOFF, now in charge of customer-service E MORTON BACH, former head of the company which built Bach trimotor airliners, is now in charge of the Electra final assembly.

• Citing that they "did attempt under most adverse and hazardous conditions to successfully land the disabled aircraft in order to preserve the scientific records that had been obtained," the War Department presented the Distinguished Flying Cross to MAJ WILLIAM E. KEPNER and CAPT ALBERT W STEVENS of the Air Corps, for their stratospheric flight from Rapid City, S D, on July 28

• Co-incident with its absorption of the future operations of Transcontinental & Western Air, Inc, TWA, Inc, announces the election of HENRY B DUPONT as Chairman of its board of directors J FRYE, J W BRENNAN, and P E. RICHTER JR., serve as vice-presidents F G WILSON as vice president and treasurer, and W J BARRY as secretary. Chairman duPont long active in the company's affairs is owner of the country's most completely equipped private airport, located at Wilmington Del

• To the many laurels of WILEY POST has been added one of aviation's most distinguished awards, the 1934 gold medal of the Federation Aeronautique Internationale. The honor, in recognition of his 1933 flight, was conferred on the round-the-world flyer on the opening day (Oct. 9) of the Federation's 34th annual conference in Washington

• A $1,000 scholarship has been presented to New York University by MRS ANNIE E. VOUGHT of Forest Hills, N Y, as a memorial to her son CHANCE VOUGHT Income of the gift, to be known as the Chance Vought Airplane Design Prize, will be used to establish a prize in the Daniel Guggenheim School of Aeronautics, to be awarded annually to the senior or graduate student in aeronautical engineering who produces the best design for an airplane of given specifications

• To make a personal study of methods of metal aircraft construction abroad G. M BELLANCA, president of Bellanca Aircraft Corporation, sailed on Oct 13 for a six weeks' visit to Italy, France, Germany and Russia.

• NRA administration at Washington has notified HOMER L. BREDOUW, president of the Bredouw-Hilliard Aeromotive Corporation at Kansas City, of his appointment as a member of the national code authority for Missouri Kansas Colorado Nebraska and the western section of Iowa An organization meeting was scheduled to be held in Washington Oct 8 and 9.

• Transfers in the Air Navigation Division of the Bureau of Air Commerce take Radio Operator C F TURNER from Terre Haute to Fort Worth, Radio Operator C. F STEINHOFF from Omaha to Cleveland, Mechanician A W. SOETH from Rock Island to Alexandria, Junior Operator HAMMER from Des Moines to Omaha, Agways Keeper GARSOMBKE from Lone Rock to Des Moines. Assistant Keeper THURBER from Columbia to Lone Rock and Junior Operator PRICE from Evansville to Kansas City

Maj. Fred 1 Smith

• The fourth annual convention of the National Association of State Aviation Officials (Sept 27-29) was convened at Cheyenne by President FRED L. SMITH State Director of Aeronautics in Ohio Mr Smith, recently promoted to the rank of Major in the Ohio National Guard has succeeded MAJ. E. J. ZISTEL as commanding officer of the 37th Division aviation

CAPT W IRVING CHAMBERS, 78, U S Navy, retired, one of the first proponents of naval aviation, died Sept 23 As early as 1910, Captain Chambers recommended the development of a naval air force and through his efforts the first flight of an airplane from the deck of a battleship, vital first step toward the modern aircraft carrier was carried out Detailed to the Bureau of Navigation in 1911 Captain Chambers made important contributions toward the development of the catapult the establishment of the Pensacola training station and the organization of the Navy's air arm

JAMES EARL GRANGER, veteran pilot and flying school operator at Clover Field Santa Monica was killed there last month while attempting a take-off in a new Keith Ryder racer, an entry in the MacRobertson Race He is survived by a wife and three sons, all of them flyers,

GUSTAVE LEMOINE 32, noted French aviator was killed near Amiens Oct. 1 when his parachute failed to open as he leaped from a disabled plane Lemoine was holder of the world speed record for land planes over 1000 km (620 miles) with payload of 1,000 kg (2,204.6 lb) established March 8 1933 At one time he also held the world altitude record As a transport pilot Lemoine had more than 3,800 hours to his credit. For the past 4½ years he had served as test pilot for the firm of Potez

Flying Services and Schools

• Sponsored by the Washington Women's Pilots Association an all-women's air meet was held at College Park, Md, Airport Oct. 13-14 The races were preceded by a meeting of the Middle Eastern Section of the Ninety-Niners, presided over by President Margaret Cooper and Dorothy Leh, governor of the district Genevieve Savage of Washington was elected as Miss Leh's successor It was voted that all women pilots not yet having private licenses may become junior members of the Ninety-Niners with all privileges except that of voting

• A crowd of 15,000 turned out on Sunday for the aerial events, a feature of which was an exhibition by four members of the Women's Air Reserve of Los Angeles, including Col Florence Lowe Barnes, Capt Bobbi Trout Capt Nancy Drake, and Lt Viola Neill They brought their Stearmans in for perfect landings after a transcontinental flight in formation. the first time women aviators had attempted a formation cross-country flight The 25 mile handicap race was won by Helen McCloskey of Pittsburgh in a Monocoupe Edna Gardner of Washington and Genevieve Savage placed second and third The next event, a spot landing contest, was won by Miss Savage Bomb-dropping honors went to Melba Beard of Pasadena, who also won the aerobatics exhibition Helen Frigo won the parachute-jumping contest

• The two hangars owned by Northland Aviation Company operating the Northland Aviation School at Wold-Chamberlain Airport, Minneapolis, have been leased for five years by Hanford Airlines, which will move headquarters from Sioux City Alterations are being made to provide for a fully-equipped engine overhaul and maintenance department radio shop and propeller and instrument shops, to be operated on a 24-hour shift The school will be continued in a section of one of the hangars and its offices will be moved to the airport administration building Students will receive part of their training in the Hanford shops.

• Recently elected members of the advisory board of the Independent Aviation Operators of the United States met in Washington Oct. 9 to formulate a definite constructive program for 1935 With Bernarr Macfadden as chairman, the board includes: Col. Theodore Swann of Alabama Col W Jefferson Davis of California, Maj C C Moseley of California, C- S Jones of New Jersey, Col I. P. Bontoey of Illinois Dr John D Brock of Missouri Fred D Fuggs, Jr of Illinois, Robert Renfro of New York Henry King of California John Wentworth of Illinois Hon William McCraw of Texas Col W. F. Easterwood of Texas

• Kenneth Unger, who has been operating at Hadley Field, New Brunswick N J for the past five years, recently expanded his activities by taking over the flying school, hangar and repair base at Westfield, N. J., formerly operated by the Fonda Aviation Corporation. His manager is, Carl Rasmussen, ex-naval pilot An Aeronca and a new Stanlard Trainer are utilized for instruction.

• A new school for gliding and soaring pilots at Elmira, N. Y., Airport has been opened by Warren F. Eaton, Two Franklin sailing gliders will be used for both the primary and advanced work. Weather permitting, flight instructions will be given daily Earl R Southee is chief instructor and business manager of the new school, to be operated as the Glider Section of the Central New York Airways of which Mr Eaton is president

• A total of 36,780,157 miles an increase of 12 per cent over the same period last year, was flown by miscellaneous operators in the first six months of 1934 according to a recent report from the Bureau of Air Commerce Passengers carried totaled 571,693, an increase of 31.5 per cent (The scheduled airlines flew 21,517,658 miles and carried 241,772 passengers in the same period) Miscellaneous operations cover all flying except scheduled transportation, and include commercial services, pleasure flying, instruction of students, and experimental flights

• A course for licensed pilots in radio training is being conducted without charge by Stinson Sales & Service at Roosevelt Field L. I. Instruction in code and in other subjects necessary for a radio operator's license will be given twice weekly Harwood Parks is the instructor

• The operation of Butler Airport at Pittsburgh has been taken over from Pittsburgh Aviation Industries by the Barr Peat Airports Company. President of the new management is D Barr Peat who was instrumental in opening and developing Bettis Field in 1925 He will devote his time to the promotion of private flying

• The University of Minnesota Flying Club has received the 1934 award of the Grover Loening Trophy and $150 in prize money for having more flying hours than any other collegiate club in the country. Plans are now being developed at the University for organizing a National Collegiate Flying Club with about 40 chapters

WOMEN PILOTS AT COLLEGE PARK

Six of the leaders of the air meet held by the Washington Women's Pilots Association at College Park Md. Oct 14. Standing left to right: Phoebe Omlie of the National Advisory Committee for Aeronautics Helen McCloskey of Pittsburgh, Blanche Barnes of Los Angeles Viola Henry of New York. Seated left to right: Genevieve Savage of Washington, Melba Beard of Los Angeles

SIDE SLIPS

By Robert R. Osborn

WE SEE by the papers that one of the competitors in the England-Australia Derby was expected to land at an intermediate point "where fresh fuel will be waiting for him." Has aviation now reached the point where we are going to have to have "fresh" fuel in order to "eliminate the harsh irritants" from our motors? Heaven help us if we are going to begin to "look for the date on the can" in order to prevent aeronautical halitosis, pink tooth brush, or B.O.

WHEN riding the airlines, that very uncomfortable and fidgety person you may notice as one of the passengers is very probably one of the line's pilots dead-heading it beck to his home port. While the rest of the passengers are "unlaxing" or trying to get the attention of the hostess, this nervous passenger frowningly disapproves of each take-off, and grabs the sides of his seat for every landing. Even on the new night sleepers, he cannot rest in comfort,—a pilot friend of ours told us that on a recent trip on one of the new Pullmans of the air he

couldn't sleep a wink all night because the pilot in charge didn't properly synchronize his engines. The rest of the passengers, of course, had a good night's sleep.

SPEAKING of the new sleepers reminds us of some advice we have been intending to pass along to the airline-riding public. On one trip of the sleepers recently, just before a landing the pilot came to the conclusion that he was not going to be able to get his landing gear down and was going to have to make a wheels-up landing. So all passengers were advised to get up and put on safety belts, which they did. After they were all set, the hitch in the retracting mechanism was corrected and everybody went back to sleep. So, our advice is: if you have a weakness for loud and brilliant colors in your night dress, or if perchance you are in that scandalous group reported to dispense with night dress, you had better have a plain and dignified pair of pajamas available under your pillow,—the landing gear might not work.

ACCORDING to an article in the New York *Times*, a new type of passenger transport airplane is equipped with "flaws which permit the reduction of wing area." Bob Fogg comments that he has heard of this method of reducing wing area before, but the trouble in the past has been that it works only once.

THE CUSTOM of airplane manufacturers in naming or numbering each one of their new models according to their own peculiar tastes, has been with us ever since the Wright brothers found it necessary to distinguish between their first airplane and the Model "B." This practice will probably remain with us until airplane production reaches the quantity now present in the automobile business, and the yearly changes in fashion and body styles become too numerous to name or number. Then, as with the automobile today, the purchaser will select his airplane merely on the pattern of the interior upholstery, the number of cigarette lighters and ash receivers, and the size of the rear luggage trunk, and not because it has a euphonious name. We do hope, however, that American airlines do not adopt the British practice of separately naming each airplane used on the line even if they are all of the same type,—one need only consider the average run of names used on American Pullman cars to realize the depths of degeneration possible. For instance, a friend of ours reports that he rode a train recently whereon "Kate O'Grady" was followed for 200 miles by "Baron Richelieu."

IT SEEMS to be a rather questionable practice of the airlines to be promoting the development of "luxury" air transport ships in the middle of a depression like the present one. As another example of the emphasis being placed on luxury we have a recent specification put out by a prominent line for a new transport which states "High Life devices to be provided."

THE October issue of *The Architectural Forum* has several articles pertaining to aviation, one of which describes the new city airport for New Orleans. Note that the "luxury" angle of the aviation business is again stressed: "The passenger accommodations comprise a two-story waiting room with mezzanine gallery used as a lounge, lunch room, dining room for more leisurely meals, ticket booths, first aid station and toilets. All are very elaborately decorated and furnished. At first sight it almost seems as if the luxury note had been overdone, but a second thought realizes that while one can put up with a bere pier when boarding a luxurious liner the bareness is tolerable only in view of the comfort to come. The best airplanes to date cannot be said to furnish so great a degree of comfort as a ship and it is proper that the terminal facilities should make up for this lack as much as possible."

We had always thought that the reason the steamship companies had big bere piers for terminals was so that the customs inspectors would have room in which to spread around the contents of our trunks and bags.

WE ARE very much disturbed by the descriptions of Mr Wiley Post's new flying suit, suitable for the 40,000 ft. altitudes at which he now expects to operate his "Winnie Mae." His suit is composed of rubber sheeting with a dural helmet and dural fittings, the wearer apparently putting it together with pipe threads instead of buttons. This sporty ensemble most closely resembles something Dr William Beebe might use in his search for new deep-sea fish, and it enables Mr. Post to supercharge himself as well as his engine. The disturbing feature of this latest style for the well dressed pilot, is that we have just been able to convince the fledgling aviator that he can fly just as well in an ordinary business suit as in leather coat, whipcord breeches and riding boots. Now that an aviator of such proven ability as Mr. Post gives his approval to such an outfit, undoubtedly we shall have the student pilots clanking about the fields in them for years to come.

EVEN at that, we'll have to admit that the new type of high altitude flying suit is far better looking than we bad expected it to be. From first descriptions published some time ago we had expected Mr Post to appear in an outfit somewhat like that of The Tin Woodman in the "Wizard of Oz" books, with some sort of an exhaust-driven supercharger mounted between the pilot's shoulder blades.

FLYING EQUIPMENT

Contract Winner

WHEN the Bureau of Air Commerca sent out a call last spring for bids on 25 airplanes for the use of its inspectors and officials, the accompanying specifications provoked more discussion among American aeronautical engineers than anything of the sort since the publication of the rules for the Guggenheim Safe Aircraft Competition, half a dozen years ago. On Aug 27 bids, which had been received from fourteen companies, were opened in Washington. On Oct. 18 the bureau announced that a contract had been awarded for 15 of the 25 to the Hammond Aircraft Company of Ypsilanti, Mich. To say that interest among designers and manufacturers has remained at a high pitch, would be putting it mildly. Nor is it likely to slacken now that preliminary details of the winning design are available, for the Model Y Hammond will be a definite departure from the orthodox along the path opened by the Stout Skycar and the Weick W-1. A low-wing, three-wheeled, cabin monoplane pusher, there are no important features of its design which are complicated or not previously tried in other designs. But an effort to refine the performance, construction, and production possibilities of such a ship is as interesting and worthwhile a program of design research as the bureau could have selected.

The layout is extremely simple. The fuselage, or car as it might better be called, has a well rounded nose and full curvature of contour carried beck around the engine. It is of all metal construction and will seat two side by side. From near its top, two struts on each side run downward and outward to brace the wings and take the loads from the two rear landing gear wheel legs. From beneath its nose a third leg projects downward to support the fully castoring front wheel. The tail surfaces are carried on two booms spars extending back from the wing structure.

Provision is made in dimension and weight schedules for 40 lb. of baggage and a parachute for each occupant. Excellent forward visibility, a low noise level due to the engine position and a smooth airflow around the nose, and a door close enough to the ground to be really convenient guarantee an exceptionally attractive cabin accommodation.

Power is furnished by a Menasco four-cylinder in-line inverted engine, which will be equipped with starter, generator and liquid storage battery. Special attention has been given throughout the ship to oil and geease fittings, replacable bushings, inspection openings, and the general reduction of maintenance costs.

From the three wheel feature and the general arrangement and proportion of the wing and control surfaces a number of operating advantages are looked for. In taking off the control stick can be pushed completely forward allowing the ship to gather speed. Then if the pilot should see that be cannot clear some obstacle he can apply full brakes and make a short stop without nosing over. It will, moreover, be impossible to stall the plane on take-off even with the stick full back.

In landing, the gliding angle can be made very steep if it is desired to land in a small space. The ship can be landed also by merely pulling the stick full back. For this latter case the forward and vertical speeds are designed to be very low and the landing gear is provided with ample shock absorbing capacity. Stall has also been carefully guarded against for this type of landing. In general, landings will be possible at any speed up to that of ordinary cruising. Once on the ground the plane should be immune from the usual hazards of misjudged cross-wind landings, ground looping, and the effect of strong gusts.

Last July AVIATION published in full the elaborate specifications which have controlled the design of the Model Y. For completion of its contract the Hammond Company must demonstrate within four months that its plane has a speed range of 35 to 110 m.p.h., can take off and clear a 35-ft. obstacle from a standing start 800 ft. distant, and land within 400 ft. over an obstacle of the same height. In addition it must possess a dozen or so exceptional safety features of control and maneuver, carry full instrument equipment and fuel for 300 miles and be a paragon of detail design from air operating and maintenance viewpoint.

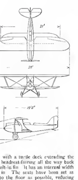
Gregor to Begin Production

ONE of the most hopeful present signs of renewed activity in the private plane market is the constantly increasing number of men and manufacturing units, for sometime feared lost to the industry, who have return to the battle. The announcement that Michael Gregor has formed the Gregor Aircraft Corporation, leased shop space at Roosevelt Field, and is starting production on five planes is especially encouraging. The place for the designer of the Bird, for the stress analyst of the Seversky amphibion, for an aeronautical engineer of 23 years experience is in the front rank of the industry not outside its borders.

The plane the new shop will produce has been designed specifically for the lowest practical price range consistent with sturdiness and adequate performance. In many ways it is a scaling down of its larger predecessor the Bird. A two-placa open biplane, powered with the 90 hp. Cirrus or Wright Gipsy, it impresses with its neatness and simplicity.

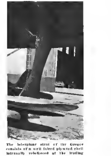
The fuselage ia of welded mild steel

Wind tunnel model of the Hammond Model Y of which fifteen have been ordered by the Bureau of Air Commerce subject to elaborate acceptance tests. A low wing two place cabin pusher, it will be powered by the four cylinder inverted Menasco. From its three wheel undercarriage it expects many unorthodox abilities designed to simplify the task of the amateur, promote general safety



The Gregoe two place sportplane and trainer. Mounting the 90 hp. Wright Gipsy or Cirrus II has been specifically designed for low priced production

The cowling over the top of the engine is carried back as a 'headrest-fairing' all the way to the built-in fin, eliminating windshields, decreasing resistance and providing an enclosure for a reserve fuel tank



The interplane strut of the Gregoe consists of a well faired plywood shell internally reinforced at the leading and trailing edges and housing a wooden diagonal running from the rear upper to the front lower spar

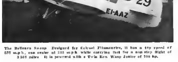
tubing with a turtle deck extending the pilot's headrest fairing all the way back to a built-in fin It has an internal width of 24 in The seats have been set as close to the floor as possible, reducing depth and providing an opportunity for the installation of a coupe cockpit enclosure if desired

Each half of the landing gear consists of a single oil and spring shock leg attached to the upper longeron, and a V hinging at the center line of the bottom of the fuselage Brakes are fitted on each wheel which mount 24x4 or 6 5x10 tires The tail skid is of the simple leaf spring type

The wing panels are of rectangular-spar-Warren-truss-rib construction, with the front spars placed exceptionally close to the leading edges A modified Eiffel 385 wing section has been used to retain the spin delaying characteristic of the Bird but to decrease its floats landing tendencies Interplane struts are of reinforced plywood construction and consist of a single I member Streamlined flying and landing wires are in a single plane with the front lower and rear upper spars The center section, supported on orthodox steel struts, contains the main fuel tank of 28 gal A smaller reserve tank holding 12 gal and fitted with a simple float type gage is mounted in the cowling between the engine and front cockpit

The ailerons and elevators are connected to the dual control sticks through tubes and crank mechanisms, ailerons being located in the upper wing only The rudder is connected to the foot pedals through the usual cables The stabilizer is adjustable

Weighing but 900 lb empty, 1,530 lb fully loaded, the plane possesses exceptional reserve power It climbs with full load 1 000 ft. in the first minute, has a top speed of 110 m p h , maneuvers neatly, yet retains a conservative landing speed and control near the stall



The Bellanca Swoop Designed for Colonel Fitzmaurice, it has a top speed of 257 m.p.h., can cruise at 233 m.p.h. while carrying fuel for a non stop flight of 3 365 miles It is powered with a Twin Row Wasp Junior of 700 hp.

Bellanca Swoop

TO AMERICANS one of the biggest disappointments of the MacRobertson Race was the forced withdrawal before the start of Col. Fitzmaurice's Bellanca monoplane Regardless of the pros and cons of the ruling which caused the withdrawal, the absence of one of the most formidable American designs was a definite and irreparable loss to the contest's value

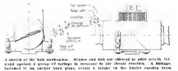
Designed from the outset for the

MacRobertson race, the Bellanca Model 28-70 has on test reached a top speed of 257 m p h , and has taken off with a gross weight of 8 350 lb carrying fuel for a non stop flight of 3 365 miles at a cruising speed of 233 m.p.h Its 14-cylinder, twin row Wasp Junior engine develops 700 hp at 8,900 ft and swings a two bladed Hamilton-Standard controllable pitch propeller of 10 ft 6 in diameter

In their basic layout, the Bellanca designers set themselves the task of retaining the advantages of a thin wing externally braced monoplane and a retractable landing gear Their solution takes the form of a wing braced by tie rods to the top longerons and to two steel supporting struts extending below the fuselage, the spacing of the lower bracing being such as to allow clearance for the landing gear wheels as they are retracted into the wing root The wing is tapered in plan form and tapered in thickness near the tips

The fuselage is of chrome molybdenum steel tubing with spruce fairing to give it a fully developed streamlined form The cover of the two cockpits, extending from the windshield to the fin, is quickly detachable in flight from either cockpit. Two cylindrical tanks, of 300 gal each occupy the entire cross-sectional area of the fuselage being designed with special channels through which the longerons are passed The engine is equipped with a full NACA cowling and all fillets between the fuselage and other parts of the plane have received the utmost of careful design to minimize drag

The landing gear when retracted withdraws completely within cavities in the wing which are covered with flaps when the gear is in the up position It is retracted by means of a positive drum and cable mechanism and uses an oleo shock absorber unit Brakes are of standard Bendix design, and are actuated by a hydraulic system The wheels mount 32x6 tires. The tail wheel is recessed into the fuselage structure



A sketch of the hub mechanism Blades and hub are allowed to slide axially forward against a group of springs in response to the thrust reaction A linkage, fastened to an anchor back plate, exerts a torque on the blades causing them to rotate

The new fully automatic variable pitch Eclipse propeller hub is designed to mount on any standard propeller shaft requires no external control fittings

and is non-swiveling consisting of a full balloon wheel with a streamlined snuff Its fixity substantially increases the directional control and stability during heavily loaded take offs

The stabilizer is plywood covered and is not adjustable longitudinal trim being secured by tab controls on the elevators The fabric covered steel tube elevators are dynamically balanced The rudder is also of chrome molybdenum framework with fabric covering and is fitted with trimming tabs The fin is of wood construction with a plywood cover Controls throughout the ship are fully equipped with ball bearings.

Not the least interesting news to come out of the Bellanca factory in recent months is the announcement that the design of Model 28-70 is being modified to fit it for practical transport use

FOR PASSENGERS OR FREIGHT

Interior of a Stinson Reliant recently delivered to General Airways Ltd of Toronto for use in Northern Canada Left: Equipped as a 4 passenger plane Right: With three seats removed for cargo carrying work The lower side walls and floor are covered with metal rather than with carpets and upholstering material

Eclipse Propeller Hub

TO THEIR long line of power plant accessories, the Eclipse Aviation Corporation of East Orange, N J , has recently added a fully automatic variable pitch propeller hub The design of the mechanism is extremely simple. The hub and blades are allowed to slide axially forward against a set of springs in response to the thrust reaction A linkage connected to an anchored back plate exerts a torque on the blade root, causing the blade to rotate, a movement forward decreasing the pitch angle The flattest pitch is thus made available under the conditions of maximum thrust which occur at take-off As the plane climbs and accelerates to top speed in level flight the blade angle gradually increases to the normal fixed-hub setting Then as the throttle is pulled back to cruising position the further reduction in the thrust permits the hub mechanism to set the blades at a still greater pitch in order to decrease specific fuel consumption

The hub and blades are installed on the plane in the same manner as any fixed pitch propeller, standard cones and locking nuts being utilized to fasten it on the splined engine shaft. Since the unit is entirely automatic there are no external controls to be connected

Fully automatic regulation of propeller pitch should have marked advantages over pilot control in combat work where time and pilot attention is at a premium It should also be attractive to private flyers, who desire the improved performance to be derived from pitch controlability, but who hesitate to accept the responsibility of constant selection.

The first commercially available model of the Eclipse hub is designed for horsepowers up to 250 and mounts on any SAE standard No 20 propeller shaft. It has been assigned type certificate No 456

THE MAINTENANCE NOTEBOOK

In Cooperation with the Maintenance Committee of the Aeronautical Chamber of Commerce

Welding Wagon

FROM Clarence Belinn, superintendent of maintenance of National Airways, Inc., based at the Boston Municipal Airport, comes a photograph of an interesting portable welding outfit which has been found very useful around his shop. The equipment consists of a sight feed carbide generator and regular oxygen bottle mounted on a dolly which has been made up from aircraft steel tubing and a pair of Stinson Model T tailwheels. Regulators, torches and rubber hose are hung on convenient parts of the frame proper. This welding outfit is always ready for service at any point in the shop or on the field.

A welding outfit that can be moved right to the job.

Cowl Jig

SHOPS doing extensive metal work on engine cowls may find a useful idea in the jig which has been developed in the shops of Northwest Airlines at St. Paul. The arrangement is extraordinarily simple and can be made up in any carpenter shop from a few pieces of flat board, two or three bolts and some heavy door hinges. As can be seen from an accompanying photograph, the jig may be folded up and stored in very small space. The flat top table on which it is supported is an essential part of the outfit. The cowl can be laid in a horizontal position on the table top for laying out the position of fittings, the establishment of center line, etc.

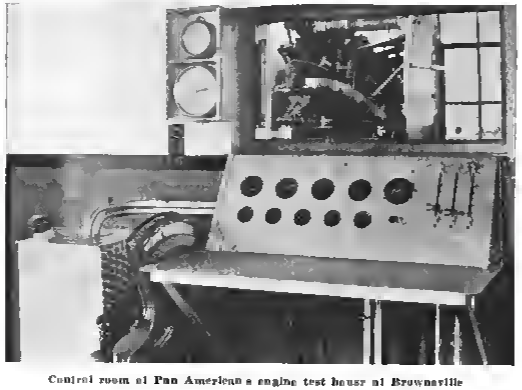
A jig developed by Northwest Airways for cowl repairs

Engine Test House

THE Brownsville Base of Pan American Airways has just put into operation a new engine test installation which incorporates a number of interesting details. The hollow-tile steel framed building is divided into two main rooms,—one housing the engine stand and the other the controls. In the test room the motor mount is located on a block of cement, cushioned in 2 in. of cork to relieve the building structure of vibration. Engine torque is taken on rubber washers which again reduces transmitted vibration. The stand is designed to take engines up to 1,000 hp.

Uniform airflow through the engines is attained from a double stack ventilator. Air is drawn downward and inward through one stack and expelled through the other. The outlets are designed so that the flow is independent of outside wind direction.

In the control room the throttles, indicating and measuring instruments are grouped in front of a soundproofed observation window. The oil tank is on the left of the operator and gasoline storage is located outside the building in an underground tank. An electric pump brings the fuel to a gravity tank in the ceiling of the observation room from which it is piped through a measuring tank to the carburetor. There is space available in the observation room for the storage of engines awaiting test and for the calibrated test propellers.



Control room of Pan American's engine test house at Brownsville

A Group of Lights

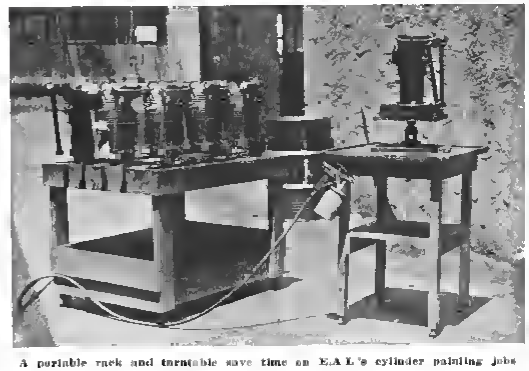
THERE are almost as many different kinds of portable work lights in use around airline shops as there are shops to use them. A group of three selected at random from widely distributed shops illustrate several practical ideas. A unit developed and used at the Boston Municipal Airport in the shops of National Airways is shown at (A). Here a telescoping steel tube upright carries an adjustable bracket on top which in turn carries the lamp and reflector. The upright is mounted in a solid cast iron base plate on three swiveling casters. It can be pushed easily around the hangar floor; at the same time the heavy base makes it stable enough to eliminate any danger of tipping over. There are four plug-in receptacles near the base from which power may be obtained for electric drills, other portable lamps, etc. Two short pieces of iron welded to the upright make convenient brackets on which the extension cords may be wound when the unit is not in use.

A unit of the same type but of a lighter pattern shown at (B) is in use in the overhaul hangar of Eastern Airlines at Atlanta. Here the light reflector is attached directly to the telescoping member of the stand without adjustable brackets by means of a standard conduit fitting. Stability is attained by a widespread welded steel tube tripod base. This unit is designed for plugging into portable power distribution boards, or wall receptacles.

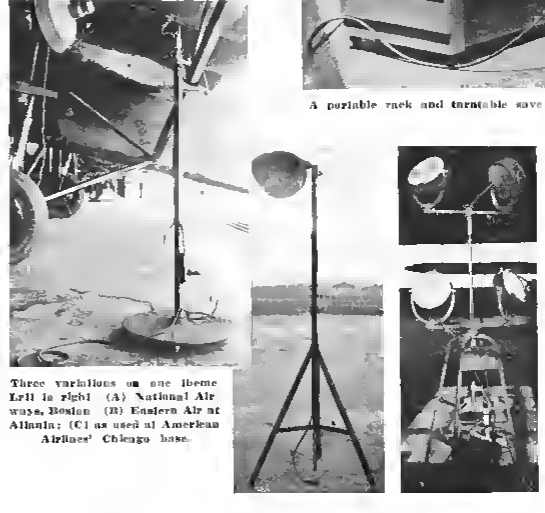
An interesting variation (C) comes from the servicing hangar of American Airlines at Chicago. The four lighting units are automobile headlights and are mounted universally in swiveling brackets. Each lamp is individually controlled from a small switchboard. Power is derived from a regular 12-volt storage battery carried in the base. Thus the unit may be used anywhere inside the shop or out on the field without connection to lighting circuits.

Cylinder Painting Rig

THE Atlanta shop of Eastern Airlines has developed a convenient method of repainting engine cylinder assemblies during overhaul. After cleaning, the cylinders are placed on a rack which forms the top of a wooden table mounted on casters. Supports for nine cylinders are provided. The rack full of cylinders is then pushed up to the painting stand which consists of a small turntable on which the cylinders may be mounted one by one and sprayed with the new finish. After painting, the cylinders go back onto the portable rack for drying and for return to the assembly line.



A portable rack and turntable save time on E.A.L.'s cylinder painting jobs



Three variations on one theme. Left to right: (A) National Airways, Boston; (B) Eastern Air at Atlanta; (C) as used at American Airlines' Chicago base.

Emergency Tool Kit

PAN-AMERICAN AIRWAYS' ships go to sea in the same sense as do ocean liners. They operate for many hours out of touch with maintenance bases and crews must be prepared to make minor emergency repairs away from home. Each ship, therefore, is provided with a complete repair kit which contains not only a full complement of tools, but also a certain number of spare parts, including one complete engine cylinder, a spare fuel pump assembly, spare control cables and rubber hose. Pieces of aluminum sheet and cans of dope and waterproof paint for emergency patches are included. Looking closely at the accompanying photograph one can see also the collection of small parts, spark plug covers, gaskets, valve springs, nuts, bolts, friction tape, etc., which are carried in a removable tray in the top of the kit. Individual compartments are provided for each item.

Emergency repair kit carried aboard PAA ships.

THE BUYERS' LOG BOOK

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials

AIRPLANE ACCESSORIES — **Flap control unit**

Rodney B Campbell & Company
1632-34 East Nadeau St., Los Angeles, Cal.

HYDRAULIC equipment for operating flaps retracting landing gear, etc., consists of combination hand pump and control valve (for cockpit mounting), oil reservoir and actuating cylinder. Complete unit (without piping) weighs 11¼ lb. Pump and valve unit alone weighs 7½ lb. Pump has positive displacement of 0·46 cu.in. for pressures up to 3 000 lb. per sq in.

AVIATION, *November 1934*

AIRPORT EQUIPMENT — **Portable hoist**

The Baker Raulang Company,
Cleveland, Ohio

THE new model CYE portable electric crane is adaptable to airplane overhaul jobs involving the handling and installation of engines, etc. Furnished in several telescoping boom lengths to cover radii from 8½ to 19 ft. Can be furnished also with towing loop for tractor use. Steering on all four wheels. All controls concentrated at operating end.

AVIATION, *November 1934*

ELECTRICAL EQUIPMENT — **Battery charger**

General Electric Company,
Schenectady, N. Y.

TWO new G-E Tungar battery charger units, one with a three-battery rack and the other for six batteries, have been produced for small shop and intermediate station use. Units mounted on welded steel frames, have shelves fitted with flexible acid-proof rubber trays. Control switches indicating ammeter, fuses incorporated. Occupy only 2 sq ft of floor space.

AVIATION, *November 1934*

ELECTRICAL EQUIPMENT — **Battery separator**

Electric Storage Battery Company
Philadelphia, Pa.

A NEW separator material—Exide Mipor—is announced for aircraft storage batteries. It is a form of vulcanized rubber in sheets, permeated with innumerable microscopic passages which permit free diffusion of electrolyte but prevent passage of any solid material from plates. Unaffected by battery solution or heat. Mechanically strong to withstand vibration.

AVIATION, *November 1934*

PARTS — **Oil seal**

National Motor Bearing Company,
1100 78th Ave., Oakland, Cal.

THE Type BB seal has been developed as an oil retainer for any rotating shaft application. It excludes extraneous matter and provides positive imprisonment for oils, grease, or other fluids. Used in supercharger section new Kinner engine. Available in sizes from ⅞ in. to 12½ in. shaft diameter. Cases in brass, cadmium-plate, or aluminum. Catalog on request.

AVIATION, *November 1934*

PARTS — **Washers**

The Wrought Washer Manufacturing Company,
Milwaukee, Wis.

ANNOUNCEMENT has been made that a list of washers especially adapted to the aviation industry has been added to this company's catalog. Washers conforming to both AN-960 and AN-970 specifications available. Can be furnished in any of the materials covered by these specifications—wrought iron or steel, stainless steel, tinned steel, brass, copper and aluminum.

AVIATION, *November, 1934*

SHOP EQUIPMENT — **Valve servicing tool**

Air Transport Equipment, Inc.
Roosevelt Field, Garden City, N. Y.

A NEW valve stem depressor for servicing Wasp and Hornet engines can be used conveniently from the front of the engine without necessity of disturbing the cowling. Working parts have been hardened to eliminate wear, and are designed so that the tool will not slip when in use. Fits easily into tool boxes, and is light enough to be carried regularly in plane.

AVIATION, *November, 1934*

SHOP EQUIPMENT — **Piston ring gage**

Wilkening Manufacturing Company,
Philadelphia, Pa.

"RING-MIKE" is a device (developed by the Circle Gauge Company of Los Angeles) for accurate measuring of O.D. of piston rings. Measures all rings on same center line by means of an accurately calibrated wrap-around steel tape. Readings appear on dial under powerful magnifying glass. Made in three sizes for rings 1½ to 4 in., 2 to 6 in.; 6 to 9½ in.

AVIATION, *November, 1934*

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VII. Hamilton monoplane, 8-place


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By Newton D. Baker

NEWTON D. BAKER, *CHAIRMAN*
NATIONAL CITIZENS COMMITTEE

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2. But these billions, divided among the families in need, average for each family only about $24 a month.
3. And 70% of the free hospital services in the United States for the needy sick are provided by voluntarily supported hospitals. The sick among the unemployed number 48% more than among the employed.
4. Likewise public health nurses, also supported by your voluntary gifts, report that 66% of all their visits in 1933 were in homes unable to pay for the service rendered.
5. 30% more children have had to be removed from their own homes and cared for by voluntarily supported children's agencies.
6. Two-thirds of all the arrests for crime involve persons between the ages of 15 and 24 years. Millions of boys and girls living under conditions destructive to character need the character-building services of your recreation agencies.
7. A man may die of despair, as well as of hunger, for suicides, numbering 15,368 in 1928, grew to 20,927 in 1932. This shows that more and more people are ceasing to value the only kind of life they are able to attain.
8. America cannot be rebuilt by relief measures alone.
9. Your local community chest needs your support during this year of rebuilding human hope and morale. It supports hospitals, clinics, child-care organizations, character-building agencies and many other social services.
10. When you give in your city, you strengthen the forces of civilization in the neighborhood in which you live.

1934 MOBILIZATION FOR HUMAN NEEDS

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At the Wall Street Skyport (above) on the East River, New York City, large transport planes are handled on the floating turntable ramp. Small seaplanes use the 400-foot floating catwalk at the left. Another turntable ramp does duty at 155th Street and Riverside Drive (see photo below). A third New York City ramp will be installed at 31st Street and East River.

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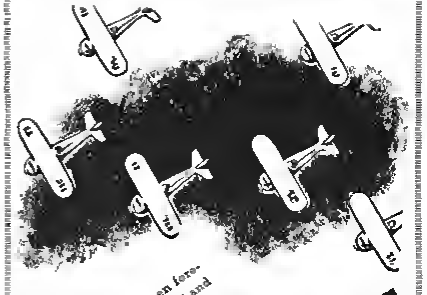

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1 inch	$6.50
2 inches	6.75 an inch
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Other spaces and contract rates on request.

An advertising inch is measured vertically on one column. 3 columns—30 inches—to a page.

COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL THE 15TH FOR ISSUE OF FOLLOWING MONTH Aviation

FOR SALE

Wings, Tail Units, Fuselage and Engine Parts for sale for Moth, Command-Aire and Robin airplanes. Also Curtiss Jr. just licensed like new $350. M. F. Steffan, 370 Hazzard, Buffalo, New York.

Announcing a New Model

Wasp Hornet Rocker Arm depressor, light but powerful, works from front of engine, will not slip. $3.00 prepaid, satisfaction guaranteed or your money back. Sole agents—Air Transport Equipment Inc., Roosevelt Field, Garden City, N. Y.

Universal Propellers

OX5, $19.95; LeBlond, Velie $18.85; Szekely, Continental $18.75. Sportplane, boat and sled propellers $6.95 up. Send 25c for leather bound flying manual, photos and information on sensational $95.00 aeroplane. Hibbs, Ft. Worth, Texas.

Hundreds of Used Planes

Crackups $30 up. OX jobs $90 up. Send 20c for Directory containing owner's price, name and address. Used Aircraft Directory, Albers, Ohio.

Warn F Kinney B-Five

348 hrs total, Heywood starter, duals, collector ring, semi-airwheels, tailwheel, Hamilton steel prop, black fuselage and red wings. Licensed to April 30. Sell for cash or trade for Waco cabin paying cash difference. Biddlecombe Flying Service, St. Louis, Mich.

BUSINESS OPPORTUNITY

PILOT or young executive wanted. Young, energetic pilot, must be of high character and hard worker. Should have a reasonable amount of executive ability and source of some capital and capable of soon taking over the management of a fast growing seaplane terminal in New York City. Edwin B. Close, 74 Rutherford Place, Arlington, N. J.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF MARCH 3, 1933

Of Aviation, published monthly at New York, N. Y., for Oct. 1, 1934.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared B. R. Putnam, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Aviation, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, N. Y. C. Editor, Edward P. Warner, 330 West 42d Street, N. Y. C. Managing Editor, Leslie E. Neville, 330 West 42d Street, N. Y. C. Business Manager, George Newbold, 330 West 42d Street, N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42d St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42d St., N. Y. C.; James H. McGraw, Jr., 330 West 42d St., N. Y. C.; James H. McGraw, James H. McGraw, Jr., and Malcolm Muir, 330 West 42d St., N. Y. C., Trustees for Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw; Curtis W. McGraw, 330 West 42d St., N. Y. C.; Donald C. McGraw, 330 West 42d St., N. Y. C.; Anne Hugus Britton, 330 West 42d St., N. Y. C.; Mason Britton, 330 West 42d St., N. Y. C.; Edgar Kobak, 330 West 42d St., N. Y. C.; Grace W. Mehren, 27 West Grand Ave., Chicago, Ill.; Midland State and Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 524 Fifth Ave., N. Y. C.; F. S. Weatherby, 271 Clinton Road, Brookline, Mass.; Midwood Corporation, Madison, N. J. Stockholders of which are: Edwin S. Wilsey, Madison, N. J.; Ella M. Wilsey, Madison, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the months preceding the date shown above is .... (This information is required from daily publications only.)

B. R. PUTNAM, Secretary.
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 25th day of September, 1934.

[SEAL] O. E. BRIENE,
Notary Public Nassau County. Clk's No. 88, N. Y. Clk's No. 112, Reg. No. 6R11.
(My commission expires March 30, 1936.)

FLYING ACES

BUYERS' DIRECTORY

Circulation 63,220 — A. B. C. Guaranteed — 67 W. 44 St., New York — Rate $5 per inch in Advance

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Leather Helmets — Flying Suits

Genuine U. S. Navy $10.00 soft leather helmets, chamois lined, quilted fur interlined, reduced to $1.85; large sizes only. Warm flying suits blanket lined $18.95 up. Few fresh stock. Celluloid sheets 1/16 in., 3/32 in., 1/8 in. 50% discount. Full line replacement parts for all motors at big savings. Send us your inquiries and orders.

AIR TRANSPORT EQUIPMENT, INC.
Roosevelt Field, Garden City, N. Y.

SUPREME PROPELLERS

(New Stock)

OX-5, Kinner, Warner, LeBlond, Velie or Gypsy	$25.00
Szekely, Cirrus, LeBlond-60 or Anzani	22.50
(Old Stock)	
Kinner or Warner	$20.00
Velie, LeBlond, Hisso, Challenger or Whirlwinds	10.00
(Reconditioned Props)	
Kinner, Warner, LeBlond or Hisso	$10.00

Deposit Required With Order

THE AIRCRAFT STEEL COMPANY, Wichita, Kansas

"SEARCHLIGHT"

IS

Opportunity Advertising

—to help you get what you want.

—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"Think SEARCHLIGHT First"

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SACRIFICE SALE

PLANES ENGINES-PARTS

5 Fords
7 Fleetsters
4 Fokker F-10's

- Wasp Parts
- Hornet Parts
- Stromberg Parts
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- Plane Parts
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Transcontinental & Western Air
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Municipal Airport
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3 LOENINGS
1 PITCAIRN PA-7

All licensed and in good condition

Offered for immediate sale

LOENINGS priced at $2000—$3500—$4000

PA-7—$2250

". . . also large stock of Kinner, Wright, Lycoming and Lorring parts for sale at sacrifice prices"

Reasonable Cash Offers will be considered

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PENNSYLVANIA AIRLINES AND TRANSPORT COMPANY
Allegheny County Airport, Pittsburgh, Pa.

INDEX TO ADVERTISERS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Aviation* assumes no responsibility for errors or omissions.

THE STINSON

MODEL 'A' is the World's Fastest and Most Economical Trimotored Airliner

• THE NEW ROAD TO REVENUE

SPECIFICATIONS

•

Cruises above 155 M.P.H. at low altitudes.

Take-off Run—under 800 feet with full load.

Initial Rate of Climb with full load —1000 feet per minute.

Landing Run, with full load—600 feet.

Fully loaded with climb above 8000 feet on two engines.

Gas Consumption—42 Gallons per hour.

Gas Capacity—160 Gallons.

Useful Load—3050 Pounds

8 Comfortable Passenger Seats

3 Baggage and Mail Compartments, with total allowable capacity of 800 pounds

3 Reliable Lycoming 260 H.P. Transport Motors

3 Lycoming Smith Controllable Pitch Propellers with chrome-vanadium steel blades

Landing Flaps—nacelle to nacelle.

Sperry Horizon and Gyro Blind Flying Instruments, Landing Lights, Flares, Shielding and Bonding. Airwheels Hydraulic Vacuum Booster Brakes

More passengers and more express poundage can be had. Tap these reservoirs of traffic

Fast, modern airplane service to medium sized cities backed up by intensive traffic solicitation is the new road to revenue.

The major cities have responded with more traffic to the fine service offered by high-speed Transcontinental planes which make fast schedules by reducing the number of stops and by flying at high altitudes, but Transcontinental planes do not serve the shorter hauls adequately

Therefore, the medium sized cities, which far outnumber the large terminals and which have the greatest need for faster service, are either being neglected or are offered airplane service which is not sufficiently attractive to impel its use. For these reasons, the fullest possibilities of the short haul are not being realized.

As early as 1929, Stinson foresaw the revenue opportunities of this situation and has produced single and trimotored planes capable of making frequent stops, serving more people, and producing the largest NET RETURN.

The latest Stinson Trimotored Airliner was conceived and built to serve the shorter haul in an economical manner. Coupled with trimotored safety for night and bad weather flying, it MAKES GOOD high speeds at low altitudes. Its trim and sturdy lines have eye appeal, while the quiet, spacious cabin, comfortable reclining chairs and fine visibility, are several of the many attractive features which expert Traffic Men know that the public now demand.

It is our belief, backed by having built 77 Trimotors which have flown more than 25 million miles, that this latest Stinson Airliner will produce GREATER NET RETURNS on short haul runs than any other multimotored transport built today.

Modern design, proven construction, and known maintenance costs, make this Airliner the safe buy of the year for forward seeing Operators who believe that people will use airplanes in ever increasing numbers if offered fast, frequent, dependable service at fair rates

STINSON AIRCRAFT CORP., WAYNE, MICH.

World's Largest Builders of Cabin Airplanes

ANNOUNCING A NEW HAMILTON STANDARD CONTROLLABLE FOR ENGINES IN THE 200 H. P. CLASS

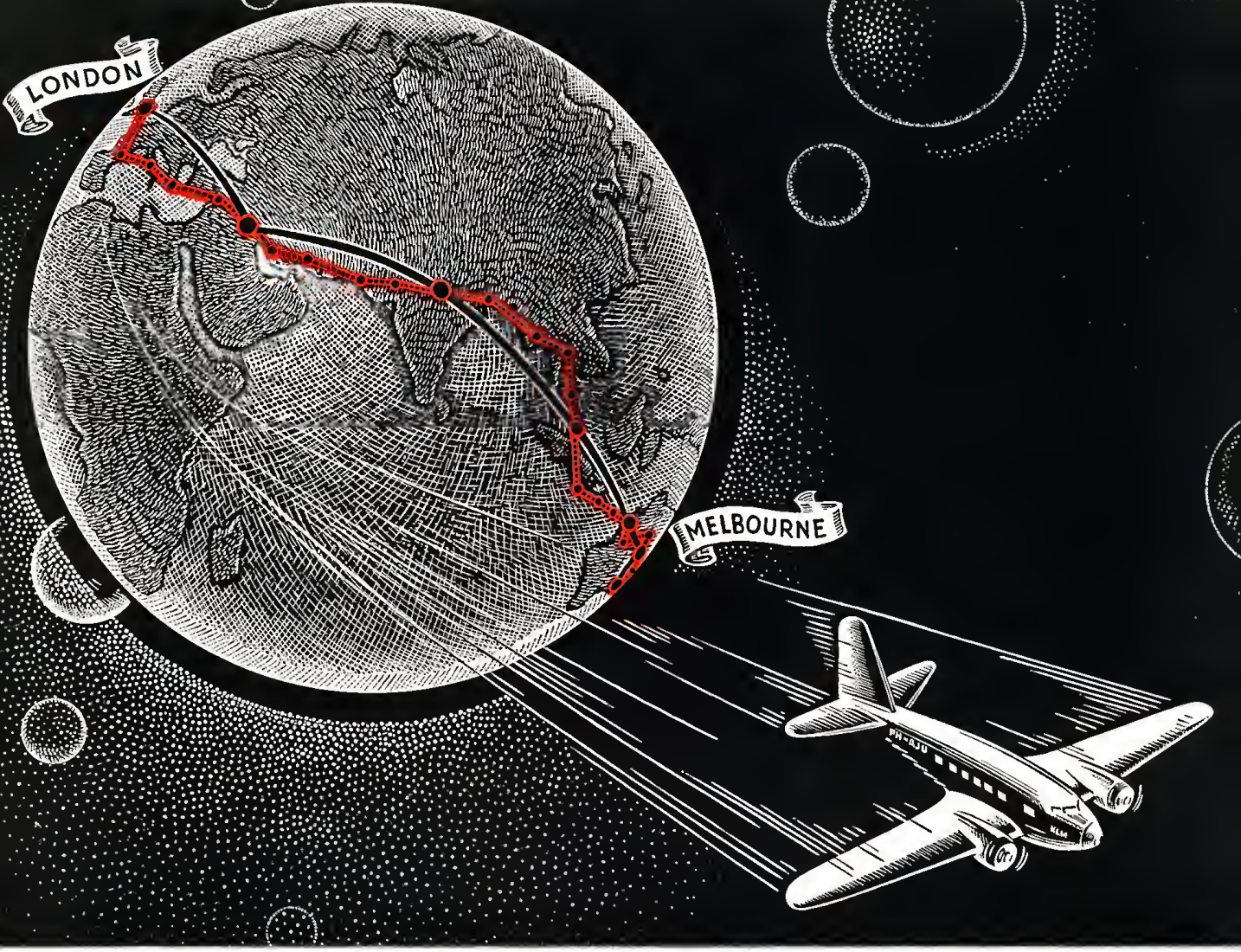
• The availability of a controllable in this power class will enable the alert manufacturer of the smaller planes to incorporate in his 1935 models those features which have made possible the high performance of the new transports now in general service on leading airlines.*

Smaller planes designed from the beginning to utilize the controllable pitch propellers and flaps will show the same relative improvement in speed, safety, and economy as the larger transports which have made America the undisputed leader of the world in air transportation.

The new Hamilton Standard Controllable is, in all essentials, a smaller edition of the propeller which was awarded the Collier Trophy as the outstanding contribution to American Aviation in 1933. Hamilton Standard Propeller Company, East Hartford, Connecticut.

HAMILTON STANDARD CONTROLLABLES

*Hamilton Standard Controllables are standard equipment on such new transports as the Douglas, Boeing, Condor, Lockheed, and Northrop



—another Achievement for WRIGHT CYCLONES

Wright Cyclone Engines powered the K.L.M. (Royal Dutch Airlines) Douglas Airliner—winner of the second prize in the London-Melbourne Race—and the first plane to cross the finish line in the Handicap Division.

The K.L.M. Douglas Airliner completed the race in the total elapsed time of 90 hours and 18 minutes. The route of flight covered the entire length of Europe, extended over Asia, across the Equator, the East Indies and the Timor Sea, and transversed the entire continent of Australia—a distance of approximately 12,293 miles—*half-way around the world.* Stops were made at sixteen airports on the long Handicap Route, as compared with only five airports on the Speed Route.

The extraordinary showing of the Cyclone-powered Douglas Airliner represents a magnificent achievement for a stock commercial transport and engines, carrying a heavy payload consisting of passengers, baggage, food and 30,000 air mail letters. It is a combined achievement for the K.L.M. pilots, K. D. Parmentier and J. J. Moll; the Douglas "Luxury" Airliner; and the Wright (Series F) Cyclones, which functioned perfectly throughout the entire flight.

Wright (Series F) Cyclones power all of the Douglas Airliners now in operation on Transcontinental & Western Air, American Airlines, Eastern Air Lines, General Air Lines and the Pan American Airways System. In Europe a large fleet of planes of the same type will soon be placed in service on K.L.M.'s route from Amsterdam, Holland, to Batavia, Java—longest airline in the world—and on Swissair.

WRIGHT
AERONAUTICAL CORPORATION
PATERSON NEW JERSEY U.S.A.
A DIVISION OF CURTISS-WRIGHT CORPORATION